



## Time and costs of impact assessment in environmental licensing: evidence of informal urban settlement in Brazil

### *Tempo e custos da avaliação de impacto no licenciamento ambiental: evidências do parcelamento de solo urbano informal no Brasil*

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#### ABSTRACT

Environmental licensing is one of the most important instruments of Brazilian environmental policy, aiming to prevent, mitigate, compensate for, or rectify environmental damage caused by projects that have the potential to cause environmental degradation. However, business sectors and politicians have criticized the costs and the delay in approving environmental licenses by environmental agencies. The urban land subdivision is subject to licensing control. When the occupation of a subdivision occurs irregularly, before the authorization of the competent agencies, corrective environmental licensing is applied in the Federal District (FD). The objective of this study is to evaluate and discuss the factors that influence the costs and time of licensing informal settlements in the FD, the state where the capital of Brazil is located, for residential purposes. This is research with a mixed approach in which documentary analysis was carried out (applications, technical manifestations, and environmental licenses) in 47 environmental licensing processes for urban land subdivision regularization in the FD. The results allowed us to conclude that corrective environmental licensing can be costly (human and financial resources) and time-consuming (long time until the issuance of the license), depending on the peculiarities of the project, and this burden is not the exclusive responsibility of the environmental agency. The proponent, urban planning competencies, regulations, and the disarticulation with other instruments contribute to the inefficiency of licensing.

**Keywords:** environmental licensing; impact assessment; transactive effectiveness; informal settlement; corrective environmental licensing.

#### RESUMO

O licenciamento ambiental é um dos instrumentos mais importantes da política ambiental brasileira que visa

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evitar, mitigar, compensar ou reparar danos ambientais de projetos capazes de causar degradação ambiental. Contudo, setores empresariais e políticos têm criticado os custos e a demora para aprovação das licenças ambientais pelos órgãos ambientais. A atividade de parcelamento de solo urbano está sujeita ao controle do licenciamento. Quando a ocupação de um parcelamento ocorre informalmente, antes da autorização dos órgãos competentes, no Distrito Federal (DF) - unidade federativa brasileira em que está situada a capital do Brasil - é aplicado o licenciamento ambiental corretivo. O objetivo deste estudo é avaliar e discutir os fatores que influenciam os custos e o tempo do licenciamento de parcelamentos de solos urbanos informais no DF para fins residenciais. Trata-se de uma pesquisa com abordagem mista em que foi realizada análise documental (requerimentos, ofícios, manifestações técnicas e licenças ambientais) em 47 processos de licenciamento ambiental de parcelamento de solo urbano em regularização no DF. Os resultados permitiram concluir que o licenciamento ambiental corretivo pode ser custoso (recursos humanos e financeiros) e moroso (longo tempo até a emissão da licença), dependendo das peculiaridades do projeto, não sendo esse ônus responsabilidade exclusiva do órgão ambiental. O proponente, competências do planejamento urbano, regulamentações e a desarticulação com outros instrumentos contribuem para a ineficiência do licenciamento.

*Palavras-chave:* licenciamento ambiental; avaliação de impacto; efetividade transativa; parcelamento de solo urbano; licenciamento ambiental corretivo.

## 1. Introduction

Environmental Licensing (EL) is a key instrument of the National Environmental Policy, aimed at regulating activities or enterprises that have the potential to cause environmental harm. The competent environmental body (federal, state or municipal) is responsible for issuing environmental permits after the assessment of the environmental documents, projects, and studies submitted by the proponent (Brasil, 1990). The EL was established as a preventive instrument of environmental management to, through a prior assessment of the potential impacts of a particular project, induce sustainable forms in human interventions and activities in the environment (Agra Filho, 2021). However, the business sector has long criticized the costs and the delay in obtaining environmental licenses, holding EL responsible for the lowest economic performance in the country (CNI, 2013; Pontes *et al.*, 2019) for being a technocratic and uncontextualized instru-

ment from the reality where it operates (Chagas & Vasconcelos, 2019).

Brazilian environmental agencies are often accused of inefficiency in the EL (Bragagnolo *et al.*, 2017). The time and financial cost of the undertaking during EL are priorities for project proponents, while environmental quality is in the background (Almeida & Montaña, 2017). For the environmental agency, the time to develop the environmental studies is short, while the proponent/entrepreneur believes that the time is longer than necessary (Duarte *et al.*, 2017; Kahangirwe & Vanclay, 2022). The literature remains scarce regarding the description of the aspects that allow for understanding the factors influencing the processing time of these processes, which leaves room for one to understand EL as a long and costly process due to the inefficiencies of the environmental agency (World Bank, 2008; Almeida & Montaña, 2017; Fonseca *et al.*, 2017). However, evidence has suggested that reasons such as non-compliance with environmental normative requirements by the

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proposers and additional information (Fonseca & Ferreti, 2022), excessive irrelevant information in environmental studies (Fernández *et al.*, 2018), inaccurate standards and lack of procedures (ABEMA, 2013), poor quality of environmental studies (Silva Junior, 2018) and delay of the proposer/consultant in responding to the additional information requested by the environmental agency (Almeida & Montaña, 2017) undermine the efficiency of EL.

This inefficiency of EL has been an argument used by political and business movements for the need to simplify the instrument (Barros *et al.*, 2017), aiming to reduce the time of issuing licenses or waiving licensing for certain activities (Brasil, 2021; Amuah *et al.*, 2023; Veronez & Montaña, 2024). The text of the General Environmental Licensing Law (GELL) (Brasil, 2021), which sets the general standards for environmental licensing, already approved by the Federal Senate, highlights the concern to simplify EL. The legislative proposal focuses on reducing time, whether by instituting simplified licenses or by exempting EL for activities currently deemed to have a significant environmental impact, such as water and sewage treatment systems and stations.

This flexibility of impact assessment restricted to the time of licensing is criticized in the literature (Enríquez-Salamanca, 2021; Fischer *et al.*, 2023). Negative and significant socio-environmental impacts are neglected in favor of the speed of the process (Sánchez *et al.*, 2019; Fonseca, 2022; Amuah *et al.*, 2023). There is a scarcity of studies that empirically explore factors used as arguments for simplifying EL, such as time and costs (Fonseca, 2022), especially for enterprises that have already settled without the proper environmental license.

The sectoral focus of this study is the activity of urban land subdivision for residential purposes. This type of activity is often subject to the EL process known as three-phase, i.e., it encompasses the Preliminary License (PL), Installation License (IL) and Operating License (OL), and Environmental Impact Study (EIS) is required in cases where the urban projects are larger than 100 hectares or in areas considered of relevant environmental interest by the competent environmental authorities (CONAMA, 1986). However, with the accelerated urban expansion, the higher demand than the supply for housing and the lack of capacity or will of the state to oversee and plan the land use, many urban parcels are implanted in Brazilian cities without prior approval, project or Environmental Impact Assessment (EIA), forming sub-normal urban agglomerates (IBGE, 2020) or parcels/lootings of informal urban soils/settlements. This type of disorderly occupation generates negative socio-environmental impacts such as floods, landslides, the proliferation of waterborne diseases, damage to biodiversity, and contamination of water and soil (Aguilar, 2008; Wekesa *et al.*, 2011; Borrero *et al.*, 2021; Souza & Samora, 2022). These impacts are aggravated by the effects of increasingly intense and frequent extreme weather events (IPCC, 2022).

In the Federal District, this informal urban occupation of the territory has occurred since the creation of Brazil's capital, Brasília. Workers who helped build the city remained in peripheral areas of the central region, forming informal urban settlements inhabited by low-income populations (Jatobá, 2016). In the following decades, hundreds of informal urban parcels expanded in the FD, including on environmentally protected areas, both by low-income populations, but also, increasingly, by

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middle and high-income populations, in the form of horizontal condominiums. To regularize these informal parcels in the FD, corrective environmental licensing is required. This process aims to promote control measures (mitigating, repairing, and compensating) for environmental damage caused, EIA *a posteriori* or ex-post (Sánchez, 2020), and for those that may still be caused in the case of urban infrastructure projects (preventive EIA).

Corrective licensing, provided in the GELL, already occurs in practice in both the federal and state levels (MG, SP, BA, RJ, PA, FD) and can occur due to two situations: activities that have been installed or operate without the proper environmental license, configuring illicit behavior (Bechara, 2007), or activities that have been installed in a period when the legislation did not demand licensing (Struchel, 2016). In the case of informal urban parcels in the FD evaluated in this work, illicit behavior is present.

Evaluation of factors that interfere with the time and cost of these impact assessment processes contributes to continuous verification of results, fostering opportunities for improvement of the instrument. This type of evaluation is related to the dimension of the transactive effectiveness of the EIA, in which the guiding question of research is: “The process was effective and efficient, delivering results in the shortest time and cost possible?” (Sadler, 1996). Studies that evaluate this dimension are scarce, and more research in this field is recommended (Loomis & Dziedzic, 2018). In the case of Brazil, the EIA for projects is evaluated within the EL framework, either preventively or ex-post (Sánchez, 2020).

In this context, this study aims to evaluate and discuss the factors that influence the time and costs

for the regularization of informal urban settlements for residential purposes in the Federal District, Brazil, within the framework of environmental licensing. This empirical research intends to contribute to the academic and public debate by showing evidence of the limitations of the application of licensing and suggestions for the improvement of the instrument.

## **2. Method**

### *2.1. Object of study: the parcels and corrective licensing processes in FD*

The plot of informal urban land for housing purposes has expanded throughout the territory of the FD since the construction process of Brasília, with the movement of workers to peripheral regions. The land issue, the high expectation of regularization, the high value of formal land, and the speed and attractive values in clandestine parcels have generated a vicious circle of informality with the proliferation of informal urban settlements in the last three decades in the FD (Jatobá, 2016; SEDUH, 2021). The predatory expansion of urban areas has exacerbated socio-environmental impacts, notably the increased incidence of infectious and parasitic diseases resulting from untreated domestic effluents, the burial of springs, sedimentation of watercourses, intensified erosion processes, and the irregular disposal of solid waste (Mesquita *et al.*, 2017; Mesquita & Almeida, 2024) and reduced water availability (Seraphim & Bezerra, 2019).

In FD, informal urban soil subdivisions to be regulated must undergo corrective environmental licensing. The FD Territorial Ordering Master Plan

(TOMP) classifies these parcels into Regularization Areas of Social Interest (ARIS), occupied by low-income population, and Regularization Areas of Specific Interest (ARINE), occupied by middle and high-income populations (DF, 2021). The issuance of the Corrective Environmental License (CEL) for regularization is based on documents, infrastructure projects, and environmental studies prepared by the proponent, who usually hires an environmental consulting firm for assistance. The goal of regularization is to provide better environmental and urban conditions in irregularly occupied areas (Brasil, 2017). Therefore, the process for issuing the CEL of these parcels is an opportunity to enhance studies and projects so that mitigating or compensatory actions ensure the rights of decent housing and the ecologically balanced environment, as enshrined by the Federal Constitution of 1988.

The environmental agency responsible for FD licensing is Brasília Ambiental (IBRAM). The CEL is based on a technical report drawn up by the licensing environmental analyst team. After evaluating the information supplementation, where necessary, of the projects and studies, the technical team positions on the deference or not of the CEL, forwarding the process to the Presidency of IBRAM, which may accept or reject the technical area's opinion. In the case of granting CEL, environmental conditions are established that the proponent must comply with and that will be monitored by the environmental agency. Figure 1 shows a summary of the steps of the licensing process for informal urban land subdivision in FD.

## *2.2. Selection of processes for analysis*

For this study, 47 processes of urban land parcels were considered in regularization, including 17 in Regularization Areas of Social Interest (ARIS) and 30 in Regularization Areas of Specific Interest (ARINE). This is a non-probability sampling. In areas of social interest (ARIS), the proponent of the application for environmental licensing is the public authority, i.e., the Housing Development Company of the Federal District, while in areas of specific interest (ARINE), the proponent may be public or private. In the case of public-owned areas, the Companhia Imobiliária de Brasília (TERRACAP) acts as the proponent, while in private property, the owner or representative of this is the proponent of the environmental licensing process.

The processes were selected according to the following criteria:

a) Projects for the regularization of urban land parcels for residential purposes. No new or commercial, or industrial plot projects were included.

b) Corrective Environmental License (CEL) application from 2009. The beginning of the research period in 2009 was determined by the introduction of Law No. 803, of April 25, 2009 (approved the Territorial Ordering Master Plan of the Federal District – TOMP/FD) and the digital availability of environmental licensing processes at IBRAM. The TOMP established targets, criteria, and actions for land regulation in urban land parcels that should be observed in the licensing.

c) CEL requirements accompanied by an environmental study to support the technical opinions of the environmental agency. Requests in which no

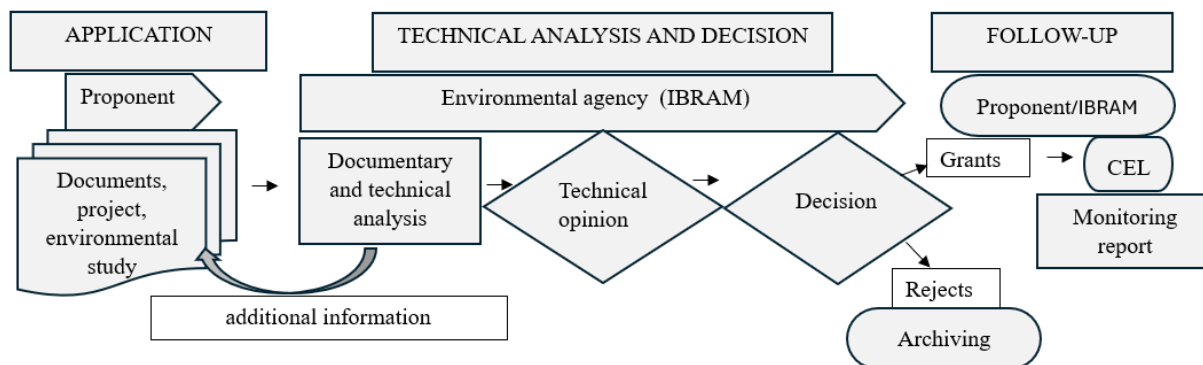


FIGURE 1 – Stages of environmental licensing and impact assessment for licensing of informal urban settlements in the FD.

LEGEND: CEL: Corrective Environmental License; FD: Federal District; IBRAM: Brasília Ambiental.

Source: authors.

environmental studies were submitted for licensing were discarded (renewal or extension of license).

### 2.3. Criteria and hypotheses for time and cost analysis in corrective environmental licensing

This research has a qualitative and quantitative approach (Creswell, 2017). The data were extracted from the regularization processes in ARIS and ARINE. The time analysis information was divided into 4 (four) categories (T1, T2, T3, and T4) and costs in 2 (two, C1 and C2). For each category, a criterion was established based on references described in Table 1.

To calculate the time of the analysis categories (T1, T2, and T3), the working days were considered. The reasons for additional information (T4) were classified into 3 groups:

1) pending documentation (minimum documentation not delivered by the proponent);

2) supplementation of the environmental study (technical team requests clarifications or adaptations of the study) and

3) others (which is not pending documentation and study supplementation).

The categories T1 to T4 and C1 and C2 were analyzed in graphs generated from Excel spreadsheets using descriptive statistics.

For the analysis categories T1 and T2, the Student-test ( $t$ ) for independent samples (analysts and proponents) was used to identify possible significant differences ( $p < 0,05$ ) between the analysis categories. This parametric test compares the averages of the samples and can be used with considerable deviations from normality (if the samples are equal or approximately equal) in size, and the test is bilateral (Callegari-Jacques, 2007). Considering the central limit theorem, samples equal to or greater than 30 cases approach the normal distribution, and the normality test requirement for application of the

TABLE 1 – Analysis categories and criteria for evaluating the costs and time spent in informal urban land subdivision processes in the Federal District, Brazil.

TEMPORAL AND FINANCIAL CATEGORY	TIME AND COST CRITERIA	DOCUMENTAL REFERENCE
T1) First Technical Analysis	. The period between the environmental license application protocol and the first response by the environmental agency.	. The officer’s request letter and the Environmental Agency’s response letter.
T2) First response of technical analysis	. Period of reply forwarded by the proponent.	. Office response of the environmental agency and Office/ letter response of the proponent.
T3) Analysis time for corrective environmental license	. The period between the application for corrective environmental license and the issue of the license.	. Application letter and the signing date of the environmental license.
T4) Additional Information	. The quantity of information supplementation required by the environmental agency in the T3 period.	. Technical manifestations produced by the environmental body.
C1) Environmental Authority	a) Number of environmental analysts who participated in the process of issuing corrective environmental license.	. Signatures of analysts in opinions and technical manifestations.
	b) Working hours for the first technical demonstration.	. Instruction IBRAM No 04, of 13 June 2023.
C2) Proponent	a) Public price charged by the environmental agency for the examination of the application for correctional environmental license.	. Document proving payment.
	b) Monetary value due by the proponent for non-measurable environmental impacts (Environmental Compensation)	. Technical opinions, environmental studies, and environmental licenses.

Source: authors.

test  $t$  is dispensed (Malhotra, 2011). The T1 and T2 samples were 47 cases each. To verify the variance homogeneity of the samples, the Levene test was considered. Levene's test verifies the equality of variance in the groups. If the test result is significant ( $p \leq 0.05$ ), we can conclude that the variations are significantly different; and if not significant ( $p > 0.05$ ), we assume that the variations are approximately equal (Field, 2009). The  $t$  and Levene tests were applied in SPSS Statistics 20 software.

The hypotheses tested for T1 and T2 were:

$H_0$ : The average time spent on the first analysis of the environmental analysts is equal to the average response time of that analysis by the proponent.

$H_1$ : The average time spent on the first analysis of environmental analysts is greater than the average response time of that analysis by the proponent.

For T3, the bicaudal test for single sample, in SPSS Statistics 20 software, was used to compare the result of the average of this category of analysis with the average of values found in the literature.

### 3. Results and discussion

#### 3.1. Time of the first analysis by the environmental agency (T1) and the first response of the proponent (T2)

The first examination of the license application by the environmental agency (T1) demanded 6,042 working days in the processes analyzed, while the reply forwarded by the proponent (T2) consumed 5,879 working days. On average (M), T1 was higher (M= 187 working days, standard deviation, SD= 196.26) than T2 (M= 145, SD = 123.61) (Figure 2). This difference was not statistically significant

( $p < 0.05$ ), so  $H_1$  is rejected (the average time spent in the analysis by environmental analysts is greater than the average response time by the proponent). The variance of the groups (T1 and T2) was approximately equal ( $p > 0.05$ ).

The results of T1 and T2 were different from those found in Middle and Middle (2010), where the first analysis of technical review had an average of 50 days, while the response of this review by the proponent had an average of 146 days. Therefore, the proponent's response time was longer than the first analysis of the environmental agency. It is not possible to infer that the responsibility for delays in CEL analyses lies with the environmental analysts or the proponents/consultants. However, it can be concluded that both spend a significant amount of time on these first demands of the process, on average, more than 5 months. Both the environmental agency and the proponent have responsibilities in delaying the deadlines for issuing the environmental license (Almeida & Montaña, 2017). An initial alignment between environmental analysts and consultants, before the application protocol, could reduce this procedural time.

To reduce this time, regulations attempt to establish legal deadlines for the demonstrations of the actors involved in EL, as envisaged in the GELL (Brasil, 2021). However, they do not attack the root of the problem, and the chance of failure is high. Brito *et al.* (2015) report that the legally established deadlines for the issuance of environmental licenses for hydroelectric projects were not respected and did not ensure speed in the licensing process. In Chile, water and power supply projects take twice as long as required by law (Irrarazaval *et al.*, 2023). Measures such as increasing the operational capacity of evolved licensing bodies, establishing guidelines or



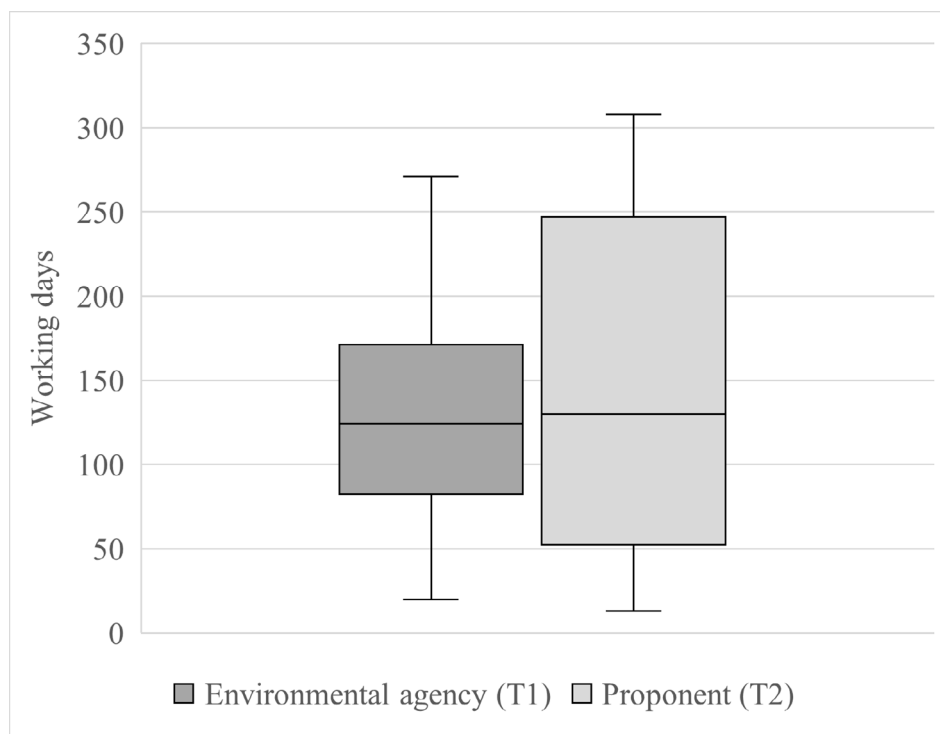


FIGURE 2 – Working days between the first analysis of the environmental agency (T1) and the forwarding by the applicant/proponent of the first response to this analysis (T2).

Source: authors.

technical manuals to assist the environmental agency and consultants, and enhancing transparency at all stages of the process with effective participation of society could contribute to making the process more effective.

A common perspective among professionals working in Environmental Licensing is that there is greater efficiency in the processing of applications when they are digitalized (Abreu & Fonseca, 2017; Chagas & Vasconcelos, 2019; Cannao & Onni, 2019; Rodríguez-Luna *et al.*, 2022). In fact, processing is faster when done online. However, further studies are needed to investigate whether this faster

processing leads to a shorter decision-making process for the issuance of the environmental license. In this research, it was not possible to prove that the processes of subdivision in regularization in the FD that were processed physically (before 2017) had a shorter time (between the request for CEL and its issuance) than when they were processed digitally in the Electronic Information System.

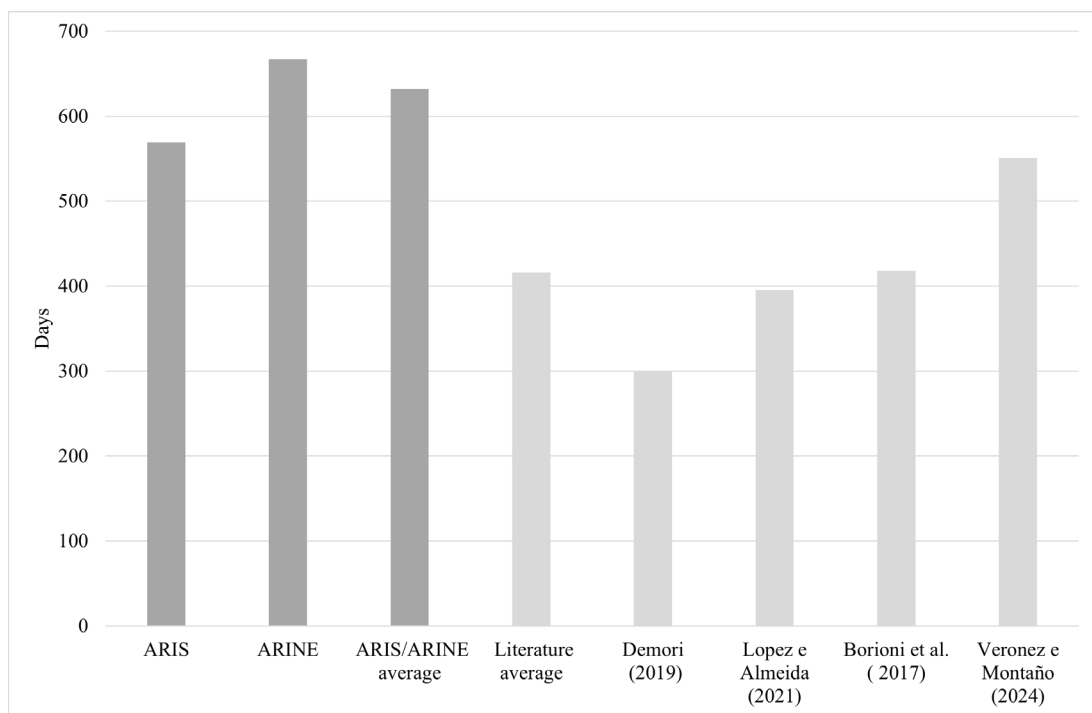


FIGURE 3— Average days spent between the license application and the issuance of the license (T3) and average for the issuance of a license found in the literature for other projects.

LEGEND: ARIS: Regularization Area of Social Interest; ARINE: Regularization Area of Specific Interest.

Source: authors.

### 3.2. Time between CEL application and license issuance (T3)

The time between the application for the approved environmental license by the proponent and the issuance of the environmental license (T3) varied greatly (min. =31 days, max. =1,747 days,  $M = 632$ ,  $SD = 447$ ). Less variation was observed in ARINE (134 days to 1,656 days,  $M = 667$ ,  $SD = 427$ ) than ARIS (31 days to 1,747 days,  $M = 569$ ,  $DP = 489$ ). This wide variation was also found in the works of Lopes and Almeida (2021), for water

capture projects in FD ( $M = 395$ ), Demori (2019) for electric energy transmission projects ( $M = 300$ ) and Veronez and Montaña (2024) and Borioni *et al.* (2017), which investigated licensing in different types of projects ( $M = 551$  and  $M = 418$ , respectively). The average T3 was significantly higher ( $p < 0.05$ ) than the literature average (Figure 3).

While the issuance of the CEL took an average of 20.7 months, the environmental license in literature, an average required 13.6 months to be granted. This longer licensing time compared to other types of projects suggests that licensing informal urban land parcels can be complex, compromising the

transactive effectiveness of the process. Such delays and morosity also occur in the impact assessment process in other countries. Chanchitpricha and Bond (2018) found that the time invested in the EIA process for electricity projects in Thailand was unreasonable. In Greece, evidence was also found in the study of Papamichael *et al.* (2023) of latency in the EIA process. Regardless of the type of project to be analyzed, there is no standard to assume an estimate of the time for the environmental license to be granted. Each project has its own territorial, institutional, political, socio-environmental, and economic peculiarities that influence the change in the issuance of the license in a few days, months, or years.

It is not possible to state that the issuance of licenses in ARIS is faster than ARINE, nor vice versa, but we can point out some reasons that contributed to the latency of licensing in these areas. Among these reasons are: acts of the Public Prosecutor's Office, the Court of Justice, and the FD Environmental Delegation; absence of processing of cases for more than 2 years; lack of manifestation of the proponent for up to 2 years, and processing of the process in other organs involved in the licensing. Therefore, CEL's morosity problems go beyond the proponent and the environmental agency, involving other competencies and institutions that require time in the decision-making process in licensing. Studies assessing the time spent between the application for an environmental license and its issuance should be encouraged, as well as investigations into the reasons that delay this process in urban land subdivision projects in other contexts.

### 3.3. *Supplementation of information by the environmental agency (T4)*

One of the reasons for the delay in licensing is the need for additional information (AI) due to the lack of data for decision-making. While they can increase the analysis time in licensing, the AI requested by the environmental agency can contribute to the evolution of environmental studies (Fonseca & Ferreti, 2022). Of the 45 processes analyzed, only 4 (four) (8%) were not verified AI by the environmental agency for licensing. Results like those found in Fonseca and Ferreti (2022), where AI was required in 89.47% of EL cases in Santa Catarina (Brazil), and Cannaos and Onni (2019), where AI was requested in 88% of EIA cases investigated in Sardinia (Italy).

On average, 3 AI were required by the FD environmental agency for deferring or not by the technical team of the CEL request. The lack of minimal documentation for the license application and the need for supplementary environmental studies were the most common requirements in this research. Specific supplements and demands for environmental and forestry compensation were classified as other (Figure 4).

The pending AI requests may be due to the lack of technical expertise among consultants (Barros *et al.*, 2017; Khan *et al.*, 2020; Guimarães *et al.*, 2024) or the meticulousness of some environmental agency analysts, who make more bureaucratic demands with fear of becoming targets of administrative improbability due to possible misunderstandings (Barros *et al.*, 2017). The poor quality of environmental studies (Borioni *et al.*, 2017; Fernández *et al.*, 2018; Nita *et al.*, 2022; Veronez & Montaña,

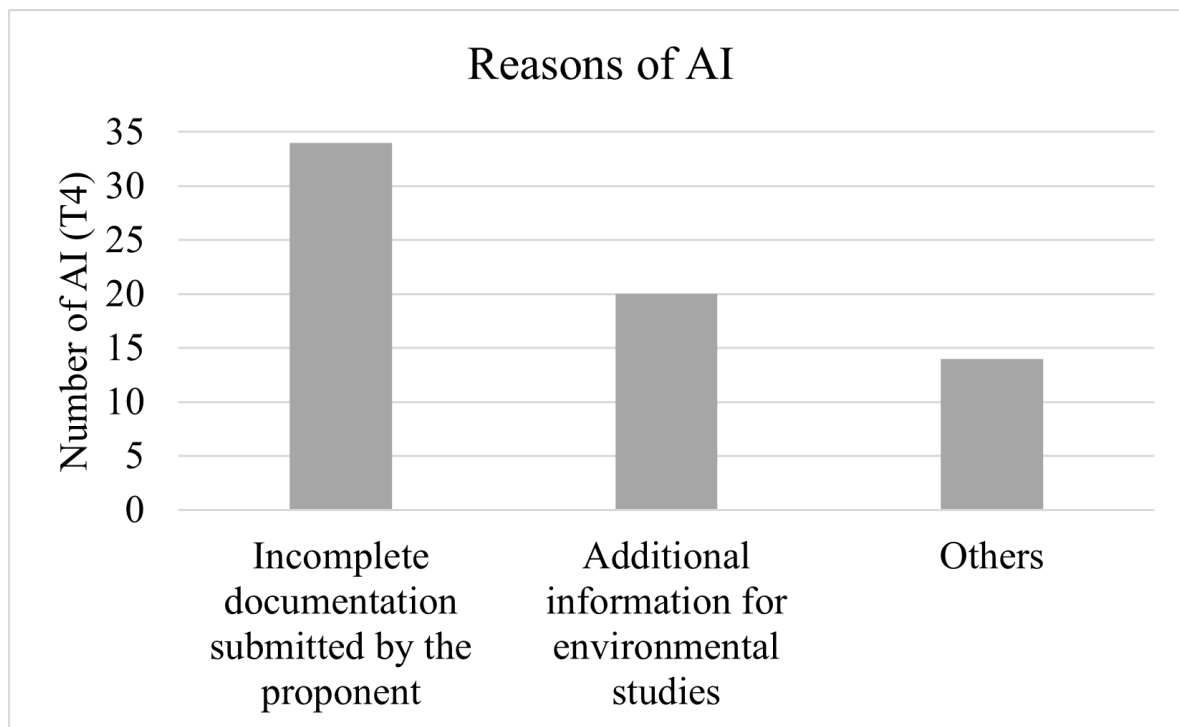


Figure 4 – Quantity and reasons for additional information (T4) in informal urban land subdivision processes under regulation in the Federal District.  
LEGEND: AI: Additional Information.

Source: authors.

2024), the lack of standardization in documentary requirements, and the low capacity of analysts (Fonseca & Ferreti, 2022; Nakwaya-Jacobus *et al.*, 2021) can also contribute to the increase of AI in licensing.

Among the documents that were not submitted together with the CEL request, the absence, in 77% of cases, of the infrastructure projects necessary for regularization (stormwater drainage, road paving, sewage systems, or water supply). The granting of water rights for the discharge of stormwater into water bodies or the abstraction of water for human consumption, as well as requirements related to

environmental compensation, were also significant pending issues in the licensing processes analyzed, at 53% and 51% of the cases, respectively.

Environmental consultants often face difficulties in submitting the minimum required documentation because they depend on other actors involved in the licensing process, such as the water permits granted by the water agency of the FD, or due to restricted access to infrastructure and urban planning projects developed by the government. As a result, environmental studies are often submitted to the environmental agency without considering these projects. The licensing process is fragmented

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into parts, with relevant projects and information being presented at different times, sometimes after the license, requiring revisions and changes as the occupation of the area in regularization changes. To save time, the proponents submit the requests in fragments or phases. This fragmentation of licensing is a globally utilized strategy to facilitate project approval, yet it adversely affects the assessment of cumulative impacts (Sánchez, 2023), rarely analyzed in the environmental impact assessment process (Amuah *et al.*, 2023; Almeida & Montaña, 2017). This scenario of segmented and insufficient information for decision-making contributes to an increase in AI requests and licensing latency.

Often, CEL is granted even without sufficient information, and the requirements are postponed in environmental conditions unrelated to the impacts of the informal urban settlements. For Santos (2017), responses are demanded from the EL that this instrument cannot provide, resulting in an overload that creates the impression that licensing is slow and bureaucratic. The author points out that there is no integration of EL with other instruments of urban policy, which are elaborated predominantly under the urban perspective. This disarticulation and overload are also present in the corrective environmental licensing in the FD. The urban project of the informal settlement itself is analyzed and approved by the Department of Urban Development and Housing of the FD, separately from CEL, which generates time-consuming, the need for project adjustments, the duplicity of information, and specific or even contradictory requirements for the proponent. For greater effectiveness in licensing, the urban design, environmental study, and infrastructure projects should be elaborated and analyzed

simultaneously by multidisciplinary teams, ensuring public participation.

### *3.4. Costs for environmental agency (C1a and C1b)*

The costs of the environmental agency for this study considered the number of environmental analysts who produced technical documents for the issuance of the CEL (C1a) and the hours worked during the initial technical review of the application submitted by the proponent (C1b). Considering the 47 processes analyzed, on average, four environmental analysts were required to produce the technical analysis documents for the CEL application. A similar result to Demori (2019), in which most of the license requests (PL, IL, and OL) were analyzed by a team of 4 analysts. The average hours worked for the first technical analysis (C1b) were 36 hours, ranging from 18 hours to 60 hours (Figure 5).

Since 2018, there has been a trend to reduce the number of environmental analysts involved in the decision-making process (C1a) and an increase in the hours worked (C1b). This fact may be linked to the standardization of simplified procedures or to the insufficient number of analysts to meet the demand of all processes (Nascimento & Fonseca, 2017). Since 2017, the possibility of submitting applications online through the Electronic Information System has increased the number of demands on the technical team responsible for environmental licensing in the FD, which has not expanded at a rate higher than when licensing processes were conducted physically. This relationship of increased demand for processes and a low number of analysts is also present at the federal environmental agency

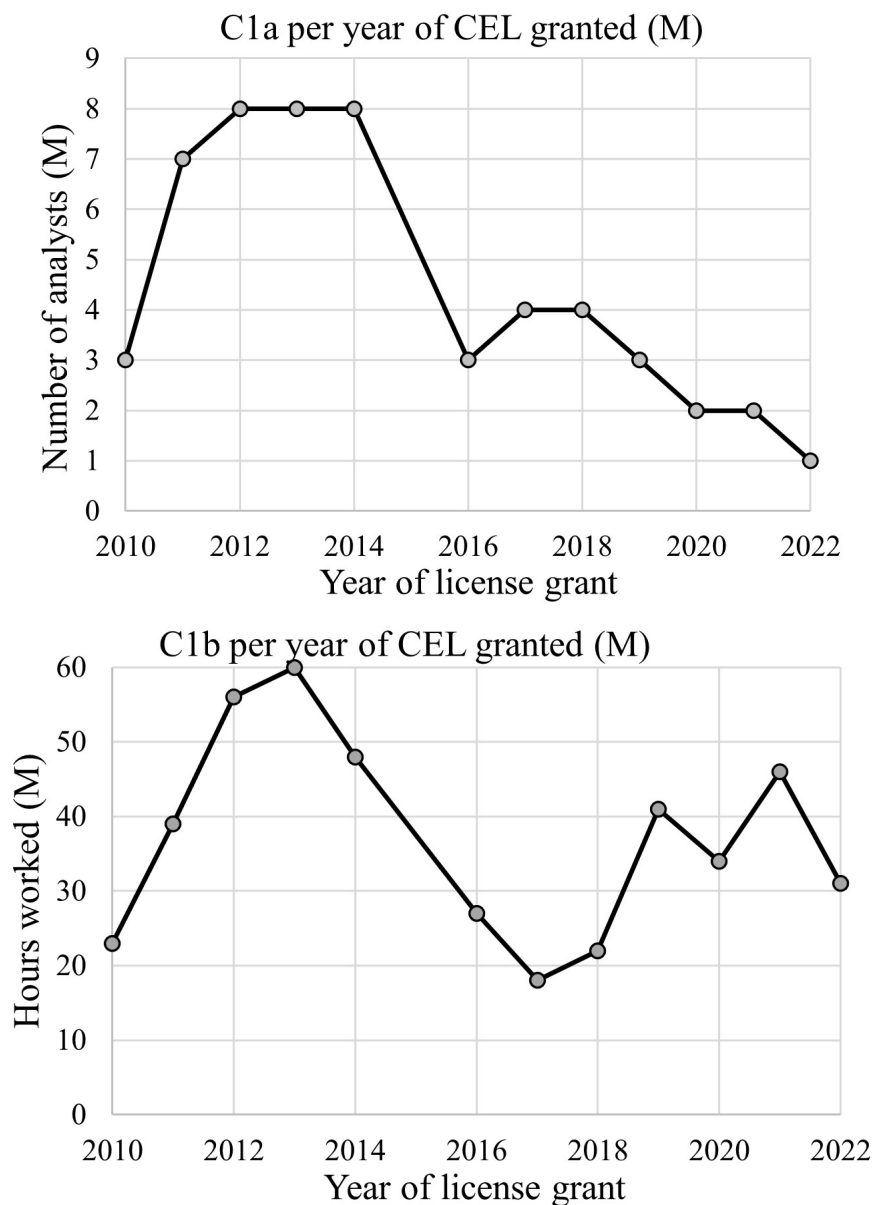


Figure 5 – Average number of environmental analysts (C1a) who produced technical analysis for issuing corrective environmental license and hours worked in the first analysis (C1b).

LEGEND: M: Average; CEL: Corrective Environmental License.

Source: authors.

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(TCU, 2019), suggesting the need to broaden the framework of environmental analysts in licensing.

The process of assessing the socio-environmental impacts of informal urban land parcels in regularization involves different areas of knowledge and is committed to reducing the multidisciplinary technical staff. In some cases, a single analyst was responsible for conducting all the technical analyses that supported the CEL's decision-making process. This lack of a multidisciplinary team within the environmental agency to assess socio-environmental impacts was also verified by Junior (2014), who studied the EL process in Volta Redonda (RJ), and by Jha-Thakur and Khosravi (2021), who investigated the EIA process in India. The hiring of new staff and periodic training, especially in the most knowledge-deficient areas of licensing, could mitigate this limitation. However, the policy discussions for normalizing the simplification of EL have focused on reducing the issuance time of licenses without considering the environmental body's technical framework and improving environmental quality (Fonseca, 2022; Fischer *et al.*, 2023; Veronese, 2023). The effects of this restricted focus on the process time for issuing licenses have not yet been systematically evaluated, leaving uncertainties regarding the direction of the socio-environmental impact assessment process and the improvements in environmental conditions.

The largest number of FD environmental analysts involved in technical analyses of licenses issued between 2010 and 2015 may be related to processes that involved Environmental Impact Studies (EIS) and Environmental Impact Reports (EIR), which legally require multidisciplinary teams for approval. Since 2017, most projects to regularize subdivisions in the ARIS and ARINE categories

have been assessed through more simplified environmental technical studies, with fewer professionals participating in these processes. Regardless of the required study, evaluating socio-environmental impacts on informal urban settlements is a complex task, especially in environmentally sensitive areas that are densely and precariously occupied. In such cases, the lack of a multidisciplinary team can lead to the neglect of significant socio-environmental impacts, causing negative externalities for society.

The reduction of multidisciplinary technical teams in the environmental agency may be influenced by the turnover of professionals. In the analyzed processes, it was possible to realize that in the correctional environmental licensing of informal urban settlements in FD, there is a high turnover of commissioned environmental analysts. Low remuneration, reduced professional experience, internal political pressures, generic or insufficient environmental standards, and decision-making responsibilities contribute to this scenario (Borioni *et al.*, 2017; Hafner, 2017; Fonseca & Ferreti, 2022). This type of situation impedes the continuity of process analysis, favoring subjectivity by different professionals (Veronez & Montaña, 2024). Expanding, valuing, and improving working conditions for both permanent and appointed staff may help reduce this turnover.

Another noteworthy aspect of this study was the number of hours required to produce technical documents because the proponent failed to submit the necessary documentation. A total of 366 hours was spent addressing basic documentation deficiencies necessary to initiate the environmental licensing request. This cost would be unnecessary if the environmental agency only accepted the proposer's protocol when it had all the required documentation.

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On the other hand, the environmental agency should review the documentation requirements that contribute to the analysis of socio-environmental impacts, avoiding the request for irrelevant or unnecessary information.

Environmental studies have also taken a considerable amount of time from analysts. The analysis of environmental studies considered faulty (requiring additional information) consumed approximately 582 hours of the staff of FD's corrective environmental licensing. In Demori (2019), the average hours for analysis of projects that required EIA was 3,419 hours, while for simplified studies it was 637 hours. One reason for this cost may be the low quality of the environmental studies submitted by the proponent (Duarte *et al.*, 2017; Nisbet & João, 2022; Veronez & Montaña, 2024). The lack of specific guidelines for the development of studies and the evaluation of alternatives with less environmental impact (Borioni *et al.*, 2017) or even the subjectivity of environmental analysts (Fonseca & Ferreti, 2022) contributes to increased costs. Often, studies are elaborated in a short period by a small technical team aimed at saving costs in the EL process (Brito *et al.*, 2015).

In general, costs incurred by environmental agencies can be increased by the negligent action of environmental consultants and proponents, but also by the lack of investments in the expansion of the multidisciplinary technical team framework at EL (Nakwaya-Jacobus *et al.*, 2021; Araújo & Carvalho, 2022). Environmental analysts have the perception of low time and cost efficiency in the EL process (Veronez & Montaña, 2024). However, this negative perception can be influenced by the inefficiency of other strategic urban planning competencies and the lack of political will. The political interventions

have focused on the speed of the process (Almeida & Montaña, 2017; Borioni & Sánchez, 2023), neglecting the real problems of implementing the EL.

### 3.4. Proponent costs (C2a and C2b)

The public price costs of CEL analysis (C2a) ranged from R\$ 790.34 to R\$ 98,418.70. In ARIS, the costs had a greater variation and were higher ( $M = R\$ 48,031.80$ ;  $SD = R\$ 28,431.89$ ) than in ARINE ( $M = R\$ 21,205.36$ ;  $SD = R\$ 14,471.53$ ) (Figure 6).

Therefore, for this study, the proponent who requested the regularization of informal urban settlements occupied by low-income population had a higher cost of CEL analysis than the proponent who requested regularization in ARINE. The high density of lots in parcels occupied by the low-income population (ARIS), when compared to ARINE, probably contributed to this scenario, as the quantity of lots influences the price. In Mesquita and Almeida (2024), 12 licensing processes were analyzed in ARIS and 14 in ARINE. Although the total area of both regions is equivalent, the number of lots in ARIS was nearly twice that of ARINE, 65,759 and 30,480 lots, respectively.

The costs spent on the public price of the corrective license are irrisory when compared to those necessary for implementing infrastructure such as stormwater drainage systems, sewage systems, road paving, among other public equipment, especially in areas with higher urban density (ARIS). Depending on the informal urban settlement, additional costs may include recovery of degraded areas, relocation of families, environmental fines, and the engagement of environmental consulting firms for the preparation of projects and environmental



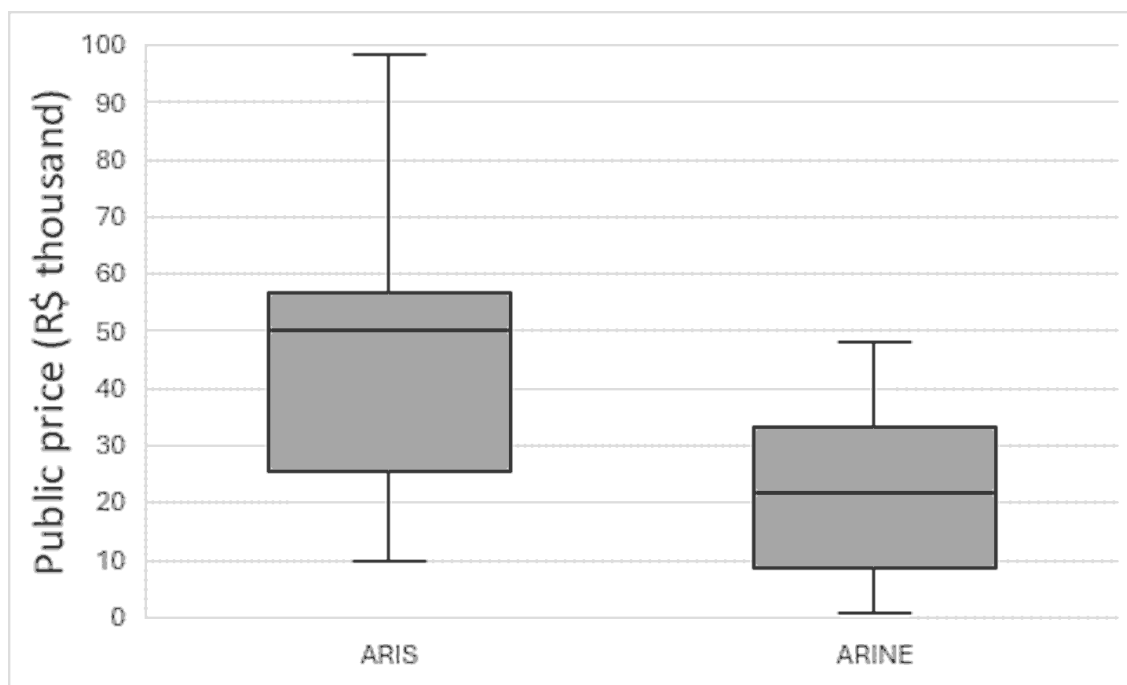


FIGURE 6 – Costs for the proponent regarding the public price (C2a) of analysis of corrective environmental license for urban land parcels in regularization of the Federal District.

LEGEND: ARIS: Area of Relevant Social Interest; ARINE: Area of Special Interest

Source: authors.

studies. In Demori (2019), the cost of licensing for environmental studies ranged from 0.7% to 8.5% of the budget for electricity transmission projects. Therefore, considering all the costs involved in the licensing, these can be substantial for proponents seeking to regularize land parcels in the FD.

Another relevant cost in the corrective environmental licensing process at FD is the Environmental Compensation (EC) due by the proponent to offset environmental impacts that cannot be mitigated (C2b). This study revealed a greater unavailability of information regarding the amounts owed by the proponents. In only 16 cases (35%),

information on the EL amounts was available. In 2 cases, this compensation was waived. EC value is calculated by the product of impact degree (size, location, environmental factors, socioeconomic aspects) and reference value (infrastructure costs). The reference value can be reduced in the case of clean technologies (solar energy, water reuse, rainwater harvesting, wastewater reuse, recycling, etc.).

The values ranged from approximately R\$ 68 thousand to R\$ 51 million, demonstrating high variation and the peculiarities of each project. By taking the most discrepant values, the average of EC for 14 processes was about R\$ 1.3 million.

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In ARIS, the average was approximately R\$ 2.6 million, and in ARINE was R\$ 830 thousand. Although estimates of EC amounts are relevant to support environmental management of the territory, proponents often postpone the execution of payments. Mesquita and Almeida (2024) found that in 94% of cases where there was the EC requirement, it was not paid, without evidence of evaluation of clean technological alternatives for the reduction amount. This important environmental management instrument seems not to have yet received the necessary attention from the public authorities and entrepreneurs (Borioni & Sánchez, 2023). In the case of regularization in ARIS and ARINE, a portion of these resources could be used for environmental improvement actions in the affected watershed of the informal urban settlement.

In general, the costs of EIA (Eni *et al.*, 2024) and environmental regularization by entrepreneurs are high (Araújo & Carvalho, 2022). If the proponent does not have a financial plan for all costs in the environmental impact assessment process during licensing, they may face difficulties in obtaining their permit. Predominantly, decision-making regarding project costs takes place before the formalization of the EL process. From the proponent's point of view, there is an established cost schedule that precedes the assessment, risks, and socio-environmental costs of the project, leaving the EL subject to the timeliness of investors and the discussion of palliative environmental measures (Texeira *et al.*, 2020).

In this study, unlike the evidence found in the research by Papamichael *et al.* (2023), where the EIA costs were not considered high, the costs for the proponent, whether public or private, can be significant. In the case of ARIS, the State itself, which is responsible for implementing the infrastructure, will

have to bear this burden. Therefore, in addition to the negative environmental and social externalities, informal urban land parcels directly affect government finances. It is crucial to concentrate efforts on enforcement and on providing housing in the formal market that is attractive to the population, especially for low-income individuals, to curb the emergence of new informal urban subdivisions.

#### **4. Conclusion**

Environmental licensing is one of the most important instruments of environmental policy, aiming to avoid, mitigate, repair, or compensate for socio-environmental damage caused by activities that may result in environmental degradation. However, there is a prevailing discourse in some business and political sectors that EL is technocratic, costly, and time-consuming, damaging the country's economic development. In this discourse, this inefficiency is attributed to environmental agencies. Although this study indicates that the costs and time consumed in corrective environmental licensing are not low, evidence has been demonstrated that proponents/entrepreneurs, environmental consultants, other actors involved, lack of articulation, and political will have a share of responsibility for this inefficiency.

The low operational capacity and the acceptance of incomplete documentation submitted by the proponent to initiate the licensing process appear to be the factors that had the greatest influence on the latency for CEL issuance by the environmental agency. For the proponent, factors such as the poor quality of environmental studies, non-compliance with documentation delivery, or environmental requirements were decisive in prolonging the time

needed for CEL issuance. A considerable amount of time is spent by both the environmental agency (T1) and the proponent (T2) on additional information (T4) due to incomplete documentation, lack of infrastructure projects, and deficiencies in environmental studies. The deadline for issuing the CEL (T3), on average, was longer than the deadlines found in the literature. However, this comparison is limited by the different types of projects in other socioeconomic contexts. There is still a relevant knowledge gap on this subject in the literature. More studies that investigate transactive effectiveness for the same typology of projects, such as urban land subdivisions, are recommended for comparison purposes and references in this field of knowledge.

In addition to the time, this work investigated the costs for the environmental agency - technical documents for the issuance of the CEL (C1a) and the hours worked during the first technical analysis (C1b) - and for the proponent - public price of CEL analysis (C2a) and environmental compensation (C2b). The costs for the environmental agency showed a tendency to decrease the number of environmental analysts to evaluate licensing requirements and increased demand for the licensing team. For the proponent, the regularization process in ARIS has a higher cost than in ARINE, although it has varied considerably and depends on the peculiarities of each project. Although Environmental Compensation (EC) is a significant cost for the proponent, this has been postponed in licensing, delaying the payment of agreed amounts. Considering all other inherent costs of licensing, the proponent must develop a financial plan that accounts for the socio-environmental liabilities prior to project decision-making. Efforts should be made to ensure that the amounts agreed upon in the EC are paid,

and that a portion of these funds is used in actions to improve the environmental quality of the regularization projects, particularly in ARIS, which face greater challenges in infrastructure and are more vulnerable to extreme climatic events.

It is suggested as measures to improve the effectiveness of environmental licensing for corrective informal urban settlement in the FD:

- a) Integrate the analysis of urban and infrastructure projects with environmental studies.
- b) Promote dialogue between environmental analysts, consultants/proponents, and other involved actors for alignment of relevant procedures and information.
- c) Increase the licensing multidisciplinary technical team, especially in the most knowledge-deficient areas.
- d) Standardize procedures and develop comprehensive guidelines to assist consultants and analysts throughout all stages of CEL.
- e) Increase the supply of housing on the formal market that is attractive to the low-income population.
- f) Focus efforts on ensuring the implementation of environmental compensation measures and on allocating a portion of these resources towards environmental and urban improvements in regularization projects within ARIS and ARINE.
- g) Enhance transparency of data and ensure effective public participation of communities affected by regularization.

In addition to the procedural issues related to costs and time, further empirical research is recommended to analyze bio-physical, social, and climate

change adaptation improvements resulting from the licensing process.

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