

ANALYSING THE NOTICES OF VIOLATION ISSUED BY IBAMA, AND THE ACTIONS TAKEN BY THE TJTO IN RELATION TO ENVIRONMENTAL CRIMES IN THE TOCANTINS, BRAZIL.

ANÁLISE DOS AUTOS DE VIOLAÇÃO EMITIDOS PELO IBAMA E AÇÕES TOMADAS PELO TJTO EM RELAÇÃO AOS CRIMES AMBIENTAIS NO TOCANTINS, BRASIL.

ANALIZANDO LAS NOTIFICACIONES DE VIOLACIÓN EMITIDAS POR EL IBAMA Y LAS ACCIONES CON RELACIÓN A DELITOS AMBIENTALES TOMADAS POR EL TJTO EN EL ESTADO DE TOCANTINS, BRASIL.

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ABSTRACT:

This study investigated the relationship between the notices of violation issued by the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) and subsequent judicial processes in the Court of Justice of the State of Tocantins (TJTO), focusing on environmental crimes in the Legal Amazon, especially in the state of Tocantins. Using a mixed-methods approach, the IBAMA and TJTO databases were analyzed through descriptive and inferential statistics, employing tools such as R Studio and Jupyter (Python) for data processing and mapping. The results revealed a negative correlation of -0.31 between the number of violations recorded by the IBAMA and the number of judicial processes in the TJTO. Qualitative analysis served to complement and evaluate the statistical results. Areas with a high incidence of environmental crimes were identified, mainly concentrated in the agricultural frontier regions and logging areas in Tocantins. This research highlights the importance of inter-institutional collaboration between IBAMA and TJTO to enhance the effectiveness of enforcement and legal proceedings. The limited capacity of the TJTO to process all cases of environmental crimes was identified as a factor influencing the observed negative correlation, indicating the need for more robust strategies to integrate administrative sanctions with judicial processes. The study concludes that to improve environmental governance in the Legal Amazon, it is essential to invest in advanced monitoring technologies and provide continuous training to professionals involved in the enforcement and prosecution of environmental crimes. The implementation of more effective and integrated public policies is also crucial for addressing the challenges posed by environmental protection in the region. This research reinforces the need for a multidimensional and collaborative approach to preserve natural resources and promote sustainability in the Legal Amazon.

KEY WORDS: Environmental crimes, environmental laws, environmental violations.

RESUMO

Este estudo investigou a relação entre os autos de infração emitidos pelo Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA) e os processos judiciais subsequentes no Tribunal de Justiça do Estado do Tocantins (TJTO), focando nos crimes ambientais na Amazônia Legal, especialmente no estado do Tocantins. Utilizando uma abordagem de métodos mistos, foram analisadas as bases de dados do IBAMA e do TJTO por meio de estatísticas descritivas e inferenciais, empregando ferramentas como R Studio e Jupyter (Python) para o processamento e mapeamento dos dados. Os resultados revelaram uma correlação negativa de -0,31 entre o número de infrações registradas pelo IBAMA e o número de processos judiciais no TJTO. A análise qualitativa serviu para complementar e avaliar os resultados estatísticos. Foram

identificadas áreas de alta incidência de crimes ambientais concentradas principalmente em regiões de fronteira agrícola e áreas de exploração madeireira no Tocantins. A pesquisa destacou a importância da colaboração interinstitucional entre IBAMA e TJTO, a fim de aumentar a eficácia das ações de fiscalização e judicialização. A capacidade limitada do TJTO para processar todos os casos de crimes ambientais foi apontada como um fator que influencia a correlação negativa observada, indicando a necessidade de estratégias mais robustas para integrar as sanções administrativas com os processos judiciais. O estudo conclui que, para melhorar a governança ambiental na Amazônia Legal, é fundamental investir em tecnologias avançadas de monitoramento e proporcionar treinamento contínuo aos profissionais envolvidos na fiscalização e judicialização dos crimes ambientais. A implementação de políticas públicas mais eficazes e integradas também é essencial para enfrentar os desafios apresentados pela proteção ambiental na região. A pesquisa reforça a necessidade de uma abordagem multidimensional e colaborativa para a preservação dos recursos naturais e a promoção da sustentabilidade na Amazônia Legal.

PALAVRAS-CHAVES: *Crimes ambientais, leis ambientais, infrações ambientais.*

RESUMEN

Este estudio investigó la relación entre los autos de infracción emitidos por el Instituto Brasileño del Medio Ambiente y de los Recursos Naturales Renovables (IBAMA) y los procesos judiciales subsiguientes en el Tribunal de Justicia del Estado de Tocantins (TJTO), enfocándose en los delitos ambientales en la Amazonía Legal, especialmente en el estado de Tocantins. Utilizando un enfoque de métodos mixtos, se analizaron las bases de datos de IBAMA y TJTO mediante estadísticas descriptivas e inferenciales, empleando herramientas como R Studio y Jupyter (Python) para el procesamiento y mapeo de datos. Los resultados revelaron una correlación negativa de -0,31 entre el número de infracciones registradas por IBAMA y el número de procesos judiciales en el TJTO. El análisis cualitativo sirvió para complementar y evaluar los resultados estadísticos. Se identificaron áreas de alta incidencia de delitos ambientales, concentradas principalmente en regiones de frontera agrícola y áreas de explotación maderera en Tocantins. La investigación destacó la importancia de la colaboración interinstitucional entre IBAMA y TJTO para aumentar la eficacia de las acciones de fiscalización y judicialización. La capacidad limitada del TJTO para procesar todos los casos de delitos ambientales fue señalada como un factor que influye en la correlación negativa observada, indicando la necesidad de estrategias más robustas para integrar las sanciones administrativas con los procesos judiciales. El estudio concluye que, para mejorar la gobernanza ambiental en la Amazonía Legal, es fundamental invertir en tecnologías avanzadas de monitoreo y proporcionar formación continua a los profesionales involucrados en la fiscalización y judicialización de los delitos ambientales. La implementación de políticas públicas más efectivas e integradas también es esencial para enfrentar los desafíos que presenta la protección ambiental en la región. La investigación refuerza la necesidad de un enfoque multidimensional y colaborativo para la preservación de los recursos naturales y la promoción de la sostenibilidad en la Amazonía Legal.

Palabras clave: *delitos ambientales, leyes ambientales, infracciones ambientales*

INTRODUCTION

The Amazon region in Brazil, known as the Legal Amazon, has faced significant environmental challenges, particularly those related to illegal deforestation and environmental crimes (Cruz et al., 2020). As the primary government agency responsible for monitoring and enforcing environmental regulations in this area, the Brazilian Institute of Environment and Renewable Natural Resources plays a crucial role in addressing these issues. However, the effectiveness of the IBAMA's actions and their subsequent judicial outcomes in the state of Tocantins have not been extensively studied.

This article aims to enhance comprehension regarding the efficacy of enforcing and prosecuting environmental offences in State of Tocantins by analyzing environmental offences in the Legal Amazon, with a particular emphasis on the state of Tocantins. It employs a comparative methodology, comparing the notices of violation issued by the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) with cases adjudicated by the Court of Justice of the State of Tocantins (TJTO). It will provide valuable insights for enhancing public policies related to environmental conservation and combating environmental crimes in the Legal Amazon region while aligning with global sustainability initiatives and efforts to protect ecosystems.

The main aim is to analyze the correlation between the violations documented by IBAMA and the ensuing legal proceedings within the TJTO to ascertain the efficacy of enforcing and prosecuting environmental offences. The research question of this investigation is: “What is the correlation between the notices of violation issued by IBAMA and the cases initiated and adjudicated by the TJTO concerning environmental offences in the state of Tocantins?”

To address this matter, we will examine the number of cases initiated and adjudicated by the TJTO in relation to environmental offences, defined as the dependent variable of this research. Additionally, we will analyze several independent variables, such as the number of violation notices issued by IBAMA, the specific type of environmental crime (such as deforestation, fires, or illegal logging), the geographical locations of the offences, the time elapsed between the issuance of the violation notice and the initiation of the legal proceedings, and the outcome of these proceedings (whether there was a conviction, acquittal, or archiving of the case).

This study used mixed methods to evaluate the research question. The underlying premise of multimethod approaches is that both qualitative and quantitative methods have their respective strengths and limitations. Qualitative methods, such as case studies, excel in capturing the nuanced, contextual, and often subjective aspects of social and political processes. These methods offer a

deeper understanding of the lived experiences, motivations, and perspectives of individuals and groups. In contrast, quantitative methods, such as statistical analyses and experimental designs, serve to identify patterns, test hypotheses, and establish causal relationships using numerical data and rigorous statistical techniques. The integration of these methods can lead to holistic and rigorous exploration of complex social and political phenomena, allowing researchers to corroborate and triangulate their findings, thereby strengthening the validity and reliability of their inferences (Sposito 2024).

This study employs mixed methods to address the research question, intending to achieve a more comprehensive examination of complex phenomena and enhance the validity and reliability of its findings (Sposito 2024). The design incorporates data analysis and basic statistical evaluation into a more qualitative evaluation based on previous studies, using a simplified nesting framework derived from Lieberman's (2005) proposition. A large-N analysis (LNA) offers preliminary insights into variable relationships, guiding small-N analysis (SNA) to address unexplained questions and delve deeper into unexpected data patterns.

Two datasets are analyzed: IBAMA's to observe issued violation notifications (2023) and "Datajud" system from TJTO (2023) to gather information on initiated and adjudicated cases. This approach provides a thorough understanding of the relationship between violations and legal proceedings. It also involves a thorough examination of the literature on environmental crimes in the Legal Amazon region using primary and secondary sources, such as legislation, academic articles, and reports from non-governmental and governmental organizations. In addition to documentary analysis, interviews will be conducted with professionals, environmental authorities, and judiciary officials to further the understanding of the matter.

The article will be organized into two sections, in addition to this introduction and brief concluding remarks. The next section focuses on the theoretical and conceptual framework surrounding environmental crimes in the Legal Amazon region. It provides definitions and categorizations of various forms of environmental crimes, along with an examination of Brazilian environmental laws and the legal mechanisms employed to combat such offences. The following section examines the functions and competencies of IBAMA and TJTO in the prevention and suppression of environmental crimes in Tocantins. It will specifically explore how IBAMA monitors and issues notices of violation and the role of TJTO in prosecuting and adjudicating these offences. Additionally, it will show and explain the obtained data, which will be analyzed statistically using IBAMA's notices of violation and TJTO's cases. This analysis includes mapping the infractions and cases throughout the state of Tocantins.

This study will make a substantial contribution to the United Nations Sustainable Development Goals (SDGs), specifically SDG 15, which focuses on safeguarding, restoring, and promoting the sustainable utilization of land-based ecosystems, managing forests in a sustainable manner, combating desertification, reversing land degradation, and stopping the loss of biodiversity (United Nations, 2015). This study presents a comprehensive examination of environmental violations and their legal ramifications, providing valuable insights for the development of more efficient public policies and environmental governance initiatives. These findings can be implemented not only in Brazil but also in other nations grappling with comparable issues.

The significance of this research for Brazil and the global community resides in the pressing necessity to counteract environmental offences that jeopardize the Amazon, a pivotal ecosystem for worldwide ecological equilibrium (Barlow et al. 2016). This work has the potential to inspire improvements in environmental management practices and strengthen international collaboration in the fight against environmental degradation by expanding the understanding of the effectiveness of enforcement and prosecution operations (Fearnside 2017).

Upon concluding, the study will provide a concise overview of the primary findings, analyze the political and practical consequences of the discoveries, and propose avenues for further research and recommendations to enhance policies aimed at addressing environmental crimes.

METHODOLOGY AND THEORETICAL BASIS

Theoretical Assessment of Environmental Crimes

The Legal Amazon is a region of utmost significance, both for Brazil and the world ecological equilibrium. This region, which includes nine Brazilian states, is essential for preserving biodiversity, regulating climate, and providing ecological services. Nevertheless, it has significant obstacles arising from illicit operations such as deforestation, logging, mining, fires, and other detrimental behaviors to the ecosystem. In the context of Brazilian law, environmental crimes refer to activities or omissions that contravene environmental legislation and result in substantial harm to the environment. The legal safeguarding of this widespread asset, which is crucial for the well-being of both current and future generations, is an extensively debated subject in the legal and environmental literature.

Silva (2010) contends that safeguarding the environment is a collective obligation of society and should be guaranteed through efficient legislative mechanisms and governmental strategies. Milaré (2015) examined the development of environmental laws in Brazil in his influential book

“Environmental Law.” He highlighted the significance of combining administrative and judicial aspects to guarantee the efficacy of environmental regulations. Milaré emphasizes that the successful implementation of environmental legislation relies on the acts of both monitoring bodies and the judiciary.

Machado (2016) emphasizes in “Brazilian Environmental Law” the importance of the Brazilian normative framework and the Judiciary’s vital role in interpreting and enforcing environmental laws. Machado underscored that the efficacy of environmental legislation depends not only on its mere existence but also on the ability of responsible entities to enforce it diligently and impartially. According to him, safeguarding the environment necessitates a proactive stance from monitoring entities and attentive intervention from the judiciary.

The Environmental Crimes Law (Law No. 9.605/1998) serves as the primary legal framework in Brazil for identifying and punishing environmental violations. Some of the most prevalent environmental offences are unlawful deforestation, arson, illicit logging, unauthorized mining, illegal hunting and fishing, and pollution. Illegal deforestation refers to the deliberate removal of natural vegetation in protected areas without permission from the environmental authorities. This activity leads to loss of biodiversity, degradation of soil quality, and disruption of hydrological cycles (MMA 2020). Unauthorized or illegal fires, which are commonly employed for agricultural and cattle purposes, are deemed criminal activities when conducted without proper authorization or within protected regions. These fires significantly contribute to the release of greenhouse gases and the devastation of natural habitats (IBAMA 2023). Illegal logging is the act of removing wood from natural forests without proper authorization or in violation of environmental regulations. This activity has a detrimental effect on biodiversity and the services provided by ecosystems (ICMBio 2022).

Illegal mining is another notable criminal activity that involves the extraction of natural resources from protected regions or without legal permission. This activity leads to the pollution of rivers and land with substances such as mercury and other pollutants (Garcia 2018). Illegal hunting and fishing refer to the act of collecting wildlife and aquatic species without proper authorization or in violation of established regulations. This activity has detrimental effects on threatened species populations and leads to the loss of biodiversity (Milaré 2015). Pollution, defined as the release of harmful pollutants by companies, automobiles, and agricultural operations, is a major environmental offence that poses risks to human health and the environment (Machado 2016).

Addressing these environmental crimes requires the involvement of multiple entities at both the federal and state levels. IBAMA, the Brazilian Institute of Environment and Renewable Natural Resources, is a federal agency tasked with implementing the National Environmental Policy. The primary duties of this system include monitoring the environment, implementing administrative penalties, and granting environmental licenses. IBAMA conducts inspections and activities to identify and suppress environmental violations, imposing fines, embargoes, seizures, and other administrative penalties on offenders (IBAMA 2023). In addition, the body is accountable for granting licenses to activities and businesses that have the potential to have substantial environmental consequences, while also guaranteeing compliance with environmental regulations (MMA 2020). IBAMA also performs the crucial tasks of monitoring and environmental control, employing advanced technologies to oversee the utilization of natural resources and detect possible violations (Machado 2016).

The Court of Justice (TJTO) in the state of Tocantins plays a crucial role in the prosecution of environmental crimes. The TJTO is tasked with the processing and adjudication of environmental crimes and the enforcement of penal consequences as prescribed by the statute. The court's activities guarantee that all parties involved in environmental procedures have the opportunity to seek justice, hence fostering fairness and openness in the rulings (Machado 2016). The judges of the TJTO analyze and enforce environmental standards, considering the intricacy of the cases and the imperative to safeguard the environment for future generations (Silva 2010). In addition, TJTO works together with monitoring entities such as IBAMA and Naturatins (Tocantins' State agency responsible for environmental protection and control and rational use of environmental resources) to guarantee the implementation of court rulings and the strengthening of administrative penalties through the judicial system (Milaré 2015).

Therefore, collaboration between IBAMA and TJTO is crucial for ensuring the efficiency of environmental governance in Tocantins. IBAMA is responsible for actively monitoring and enforcing administrative sanctions, while TJTO guarantees that the most serious violations are properly prosecuted and that those who commit them are penalized in accordance with the law. Integration among these entities is essential to ensure the preservation of natural resources and advance sustainability in the Legal Amazon region.

Methodological consideration

This study uses mixed methods to evaluate the research question. Multimethod approaches', also known as mixed methods (MM), underlying premise is the recognition that both qualitative and quantitative methods have

their respective strengths and limitations. Qualitative methods, such as case studies, excel in capturing the nuanced, contextual, and often subjective aspects of social and political processes. These methods offer a deeper understanding of the lived experiences, motivations, and perspectives of individuals and groups. In contrast, quantitative methods, such as statistical analyses, and experimental designs, serve to identify patterns, testing hypotheses, and establishing causal relationships by numerical data and rigorous statistical techniques. The integration of these methods can lead to a more holistic and rigorous exploration of complex social and political phenomena, allowing researchers to corroborate and triangulate their findings, thereby strengthening the validity and reliability of their inferences (Sposito 2024).

This study uses a design that combines statistical analysis with case studies and qualitative data-based methodologies to diminish uncertainties inherent to inferences derived from each methodology (Johnson et al. 2007). It uses a simplified nesting framework proposed by Lieberman (2005). It relies on a large-N analysis (LNA) as a preliminary analysis to estimate the strength of the relationship between variables of interest and to identify which variables deserve attention in small-N analysis (SNA). Complementarily, SNA serves to answer questions not explained in LNA and to identify the processes to understand unexpected patterns in the data in greater depth.

The IBAMA and TJTO databases were analyzed quantitatively. The quantitative analysis utilized descriptive and inferential statistics to compare the infraction and case data. Additionally, it includes the use of tools such as R Studio (R Studio Team, 2020) for data processing and visualization. The IBAMA database will be employed to delineate and expound upon the notifications of violations that have been issued, while the “Datajud” system of TJTO will furnish information regarding cases that have been initiated and adjudicated. This methodology will facilitate a comprehensive comprehension of the interplay between transgressions and legal proceedings. Andrade (2015) examined environmental crimes and laws in Brazil, whereas Barbosa and Silva (2018) explored the difficulties and prospects of environmental crimes in the Amazon region. The open datasets from IBAMA (2023) and TJTO (2023) served as the quantitative foundation for the investigation.

RESULTS AND DISCUSSION

The roles and significance of IBAMA and TJTO in the prevention and enforcement of environmental crimes in Tocantins are discussed

The Legal Amazon is internationally acknowledged for its exceptional biodiversity and crucial function in controlling the world climate (Barlow et al. 2016). Nevertheless, this area is consistently subjected to illicit activities,

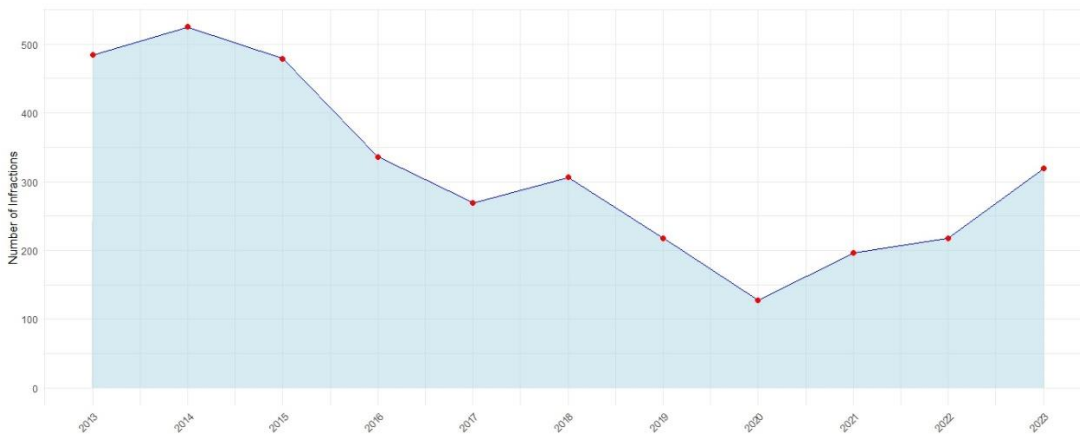
including deforestation, fires, illegal logging, and mining, which pose a significant threat to its ecological stability (Fearnside 2017).

Tocantins, situated in the Legal Amazon, play a vital role in preserving the ecology and reducing the impact of global climate change. It is a state located at the last agricultural expansion frontier (MATOPIBA), being the place for significant deforestation processes. The function of agencies tasked with monitoring and prosecuting environmental crimes is crucial for guaranteeing the safeguarding of natural resources in this particular context. This section empirically analyses the functions of the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) and the Court of Justice of the State of Tocantins (TJTO), emphasizing their significance in the prevention and punishment of environmental offences. IBAMA is the primary federal agency tasked with implementing the National Environmental Policy.

Established via Law No. 7.735 in 1989, the IBAMA was entrusted with multiple duties, such as overseeing the environment, imposing administrative penalties, granting environmental permits, and monitoring natural resources (MMA 2020). IBAMA's primary role is environmental monitoring, which involves performing inspections and activities to identify and suppress environmental violations (Milaré 2015). The enforcement measures implemented by the IBAMA, such as monetary penalties and restrictions, are crucial in deterring illicit activities and fostering ecological restoration (IBAMA 2023).

The examination of IBAMA's notices of violation data in Tocantins (Graph 1) demonstrates substantial fluctuations in the quantity of infractions documented throughout the years. An apex was detected in 2014, followed by a slow decrease until 2019, with a subsequent rise in 2023. The data included in IBAMA's report from 2023 provide an accurate representation of the changes in monitoring activities and the fluctuations in environmental pressures over a specific period. The observed tendency may be attributed to factors such as alterations in monitoring policies, seasonal fluctuations in illicit activities, and the efficacy of monitoring measures.

Graph 1: Total Number of Notices of Violation in the State of Tocantins by Year (IBAMA)

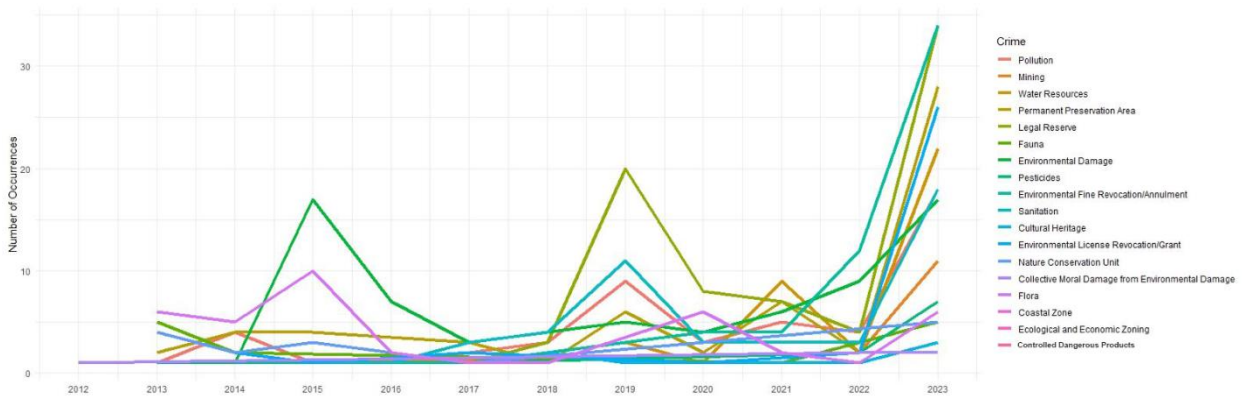


Source: authors, 2024.

The Court of Justice of the State of Tocantins (TJTO) has the authority to prosecute and adjudicate cases involving environmental offences, enforcing both criminal and civil penalties, as outlined in Brazilian legislation (Machado 2016). The job of TJTO is vital in ensuring that offenders are appropriately penalized in accordance with environmental standards. TJTO's effective prosecution of environmental offences assures compliance with environmental regulations and acts as a potent deterrence for potential violators (TJTO 2023).

Graph 2 displays the statistics on TJTO's legal proceedings, highlighting the various types of environmental crimes documented, such as pollution, mining, water resource damage, and animal offences. The data indicate that there are spikes in specific years (especially in 2023), which implies that there were periods of heightened monitoring efforts or an increase in environmental violations (TJTO 2023). The multitude and variety of documented environmental offences underscore the intricacy of the task encountered by TJTO in pursuing legal action against these instances (Garcia 2018).

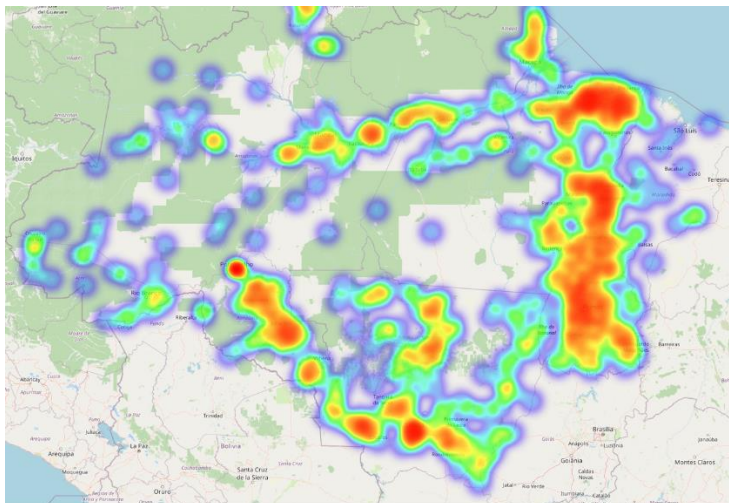
Graph 2: Evolution of Environmental Crimes TJTO



Source: authors, 2024

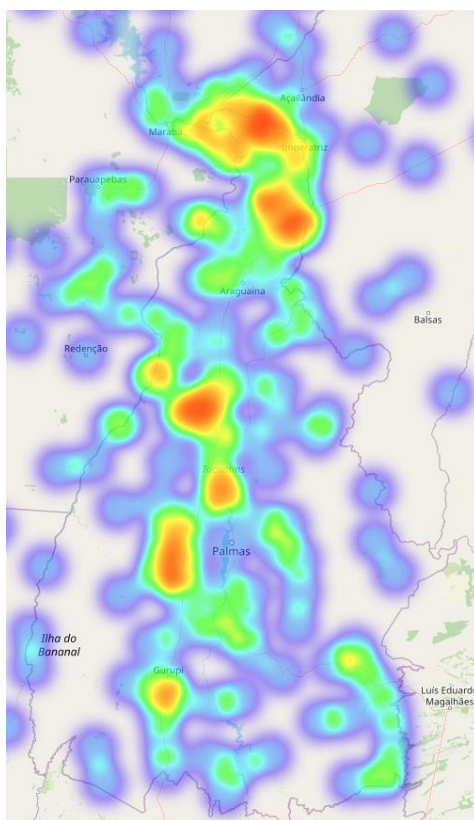
Utilizing tools like Jupyter (Python), geospatial analysis of environmental crimes in Tocantins enables the identification of regions that are particularly susceptible to unlawful activity (see figures 1 and 2). The heat maps derived from these data expose concentrated areas of environmental crimes commonly found in agricultural frontier zones and logging areas (IBAMA 2023). These regions are experiencing deforestation and wildfires owing to the increasing need for additional agricultural and grazing pastures. Illegal logging commonly occurs in isolated regions where surveillance is more arduous (Garcia 2018).

Figure 1 – Map of IBAMA’s notices of violation in the legal Amazon area
Source: Own elaboration from data of IBAMA



Source: Authors, 2024 from data of IBAMA

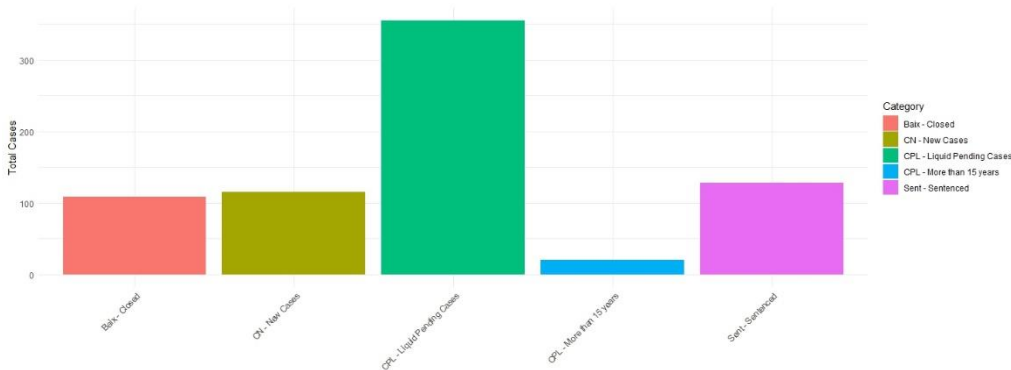
Figure 2: Map of IBAMA’s notices of violation in the state of Tocantins



Source: Authors, 2024 from data of IBAMA

Graph 3 also offers a comprehensive depiction of many classifications of environmental crimes and their respective frequencies. The examination of these graphs reveals that the pending clean cases (CPL) have the highest quantity, followed by the new cases (CN), and the closed cases (Baix). The distribution of environmental processes in TJTO indicates that most of these processes are still occurring, which highlights the intricate and extended nature of judgements. Assessing the efficiency of the shift from administrative to penal sanctions requires a thorough examination of the correlation between IBAMA’s notices of violation and TJTO’s court processes. Initial data analysis indicates a direct correlation between the quantity of violation notices and the quantity of judicial processes, suggesting that a significant portion of the breaches identified by IBAMA lead to legal proceedings in TJTO (TJTO 2023).

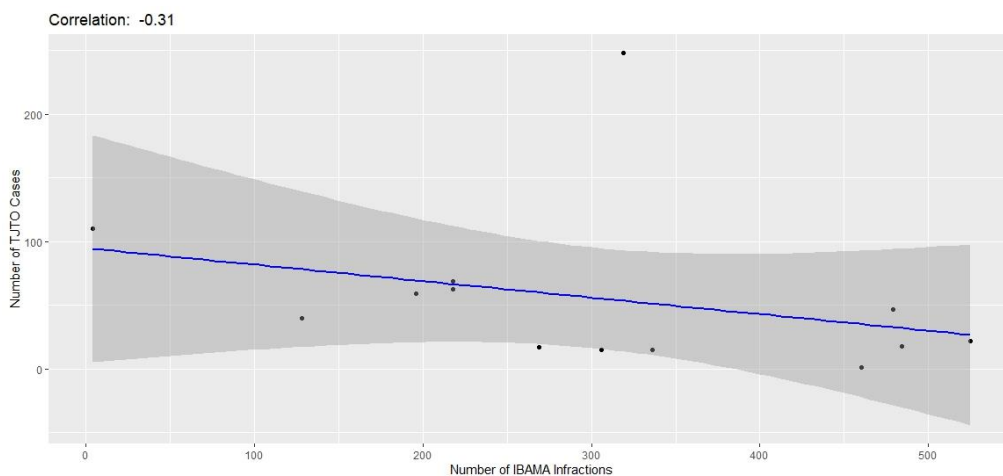
Graph 3: Environmental Crimes TJTO by category



Source: Authors, 2024 from data of DATAJUD

Nevertheless, the effectiveness of this transformation could be hindered by issues such as the accessibility of evidence and the judiciary’s capability to manage the quantity of cases (MMA 2020). To enhance the efficacy of monitoring and prosecution efforts, several measures are required. It is crucial to invest in modern monitoring technologies such as satellites and drones to enhance the identification and reaction to environmental violations (Barlow et al. 2016). Regular training of monitoring and judiciary experts is essential to ensure that they are adequately equipped to handle the intricacies of environmental cases (Fearnside 2017). Also, enhancing environmental regulations and ensuring that penalties are adequately discouraged are crucial measures to successfully address environmental violations (Milaré 2015).

Graph 4: Correlation between IBAMA and TJTO



Source: Authors, 2024 from data of DATAJUD/IBAMA

The correlation, presented in Graph 4, illustrates a negative correlation of -0.31 between the number of IBAMA infractions and the number of processes in TJTO. This association indicates a negative relationship between the two variables, where a rise in the number of violations documented by IBAMA is typically linked to a decrease in the number of legal processes in TJTO, and vice versa. Initially, this conclusion is paradoxical, as one would anticipate that a rise in environmental violations would result in a proportional increase in legal proceedings.

Therefore, the significance of coordination between IBAMA and TJTO cannot be exaggerated, highlighting the need for these organizations to work together to effectively identify, penalize, and take legal action against environmental violations (Machado 2016). The effective integration of administrative monitoring and penal prosecution is crucial for safeguarding natural resources and fostering sustainable development in the Legal Amazon region. (Silva, 2010).

The findings from the examination of IBAMA's notices of violation data and TJTO's judicial processes stress a demand for inter-institutional coordination in Tocantins for the prevention and enforcement of environmental crimes. The synergy between administrative surveillance and penal prosecution is vital to guarantee the safeguarding of natural resources and foster sustainability in the Legal Amazon (MMA 2020).

Furthermore, it is crucial to enhance environmental legislation by addressing any loopholes and ensuring that penalties are strong enough to discourage violations (Fearnside 2017). Implementing efficient environmental recovery measures is crucial for reducing the harm caused by violations and promoting long-term sustainability (Barlow et al. 2016). The data analysis indicated the necessity of implementing a comprehensive and synchronised strategy to address environmental offences in Tocantins. Collaboration between IBAMA and TJTO is crucial to guarantee the efficient detection, sanctioning, and prosecution of environmental breaches (Silva 2010).

However, the collaborative efforts of IBAMA and TJTO signify a pivotal advancement in safeguarding the environment and advocating environmental equity (Machado 2016). This study offers a robust dataset and analysis that can guide the development of more efficient public policies and enhance environmental governance in the region (MMA 2020). Effective environmental protection in Tocantins and the Legal Amazon region relies on strong environmental governance that involves collaboration between monitoring agencies and courts, as well as the efficient utilization of monitoring and analysis technologies (Barlow et al., 2016).

In addition to coordination, both IBAMA and TJTO require budgetary and human resources to enhance their institutional capacity and responsibility. Prioritizing the evaluation of IBAMA's monitoring actions is of utmost importance. The effectiveness and productivity of monitoring operations can substantially affect the identification and documentation of violations. By intensifying its monitoring efforts and implementing more effective punishments, the IBAMA can potentially decrease the necessity for legal action, as administrative penalties alone may be sufficient to discourage violators and encourage adherence to regulations (IBAMA 2023).

To enhance the efficacy of monitoring and prosecution efforts, prioritizing the allocation of resources towards modern monitoring technologies, such as satellites and drones, is crucial for enhancing the identification and prompt handling of environmental violations (Garcia 2018). It is imperative to provide ongoing training for monitoring and judiciary experts to ensure that they possess the necessary skills and knowledge to handle the intricate nature of environmental matters effectively. Moreover, the Tocantins court system's ability to handle environmental claims could be another crucial element. TJTO encounters substantial obstacles, such as an excessive number of cases, the intricacy of environmental procedures, and constrained resources (TJTO 2023). These issues may result in the prioritization of cases and the potential for non-prosecution of all infractions documented by the IBAMA. The judiciary's constrained capacity may lead to the ranking of more serious or symbolic cases for trial, while other cases are settled through administrative means.

An examination of prior graphs indicates that a significant number of environmental proceedings are still unresolved inside the legal system. The delay in resolving these cases may be attributed to the inherent intricacy of environmental crimes, which frequently entail technical and scientific evidence and involve several factors. The prolonged resolution of these cases can affect the perception of the efficacy of prosecuting environmental violations.

Another factor that should be considered is the potential influence of environmental governance policy. Public policies and targeted programs can impact the correlation between environmental violations and legal proceedings. Environmental regulatory programs can provide offenders with the chance to rectify their conduct without undergoing legal punishment, thereby diminishing the number of cases brought before the judicial system. When properly executed, such programs have the potential to enhance environmental compliance and alleviate the workload of the judiciary (Milaré 2015).

FINAL CONSIDERATION

The purpose of the research was to address the central question: “What is the correlation between the notices of violation issued by IBAMA and the cases opened and adjudicated by TJTO in relation to environmental crimes in the state of Tocantins?” To investigate this enquiry, we conducted a thorough examination of data obtained from IBAMA’s notices of violation and TJTO’s legal proceedings. The objective was to ascertain the efficacy of enforcement and prosecution measures in combating environmental crimes in the Legal Amazon, with a specific focus on the state of Tocantins.

The initial hypothesis posited a positive correlation between the number of infractions documented by the IBAMA and the number of legal processes in TJTO. The data analysis showed a negative correlation of -0.31 between these variables, suggesting that when there are more infractions reported by IBAMA, there tend to be fewer judicial processes in TJTO, and vice versa.

This negative correlation can be attributed to various variables. The efficacy of administrative fines imposed by the IBAMA can have a pivotal impact on discouraging violators. Effective administrative punishments can settle numerous environmental breaches without resorting to prosecution, thus accounting for the decrease in the number of judicial processes, even in the presence of a significant number of infractions (IBAMA 2023). Moreover, the effectiveness of IBAMA’s monitoring operations can result in the prompt administrative resolution of numerous violations, hence reducing the necessity for lengthy legal proceedings (MMA 2020).

Another aspect to consider is the capacity of the Tocantins judiciary. TJTO is confronted with substantial obstacles, such as an excessive number of cases, the intricacy of environmental procedures, and a scarcity of resources (TJTO 2023). These problems may lead to the prioritization of more serious or symbolic instances for trials, whereas other breaches are addressed through administrative means. The graphs “Total Number of Environmental Crimes TJTO by Category” demonstrate that there is a significant backlog of environmental cases in TJTO. This suggests that the judiciary’s ability to process all cases in a timely manner is constrained (Silva 2010).

Geospatial analysis of environmental crimes in Tocantins identified specific locations that are particularly susceptible to illicit operations, including agricultural frontier zones and logging areas. These regions are experiencing deforestation and fires owing to the increasing need for additional agricultural and grazing pastures. Illegal logging commonly occurs in isolated regions where

surveillance is more difficult. It is crucial to identify these “hotspots” to direct more efficient and comprehensive monitoring measures (IBAMA 2023).

Collaboration between IBAMA and TJTO is essential for a comprehensive approach to address environmental crimes. Coordination among these entities guarantees that environmental violations are dealt with efficiently, either through administrative penalties or legal proceedings (Machado 2016). Nevertheless, the issues of data integration and effective communication among institutions persist and require a resolution to enhance environmental governance.

To enhance the prevention and suppression of environmental offences in Tocantins, it is imperative to foster better collaboration between IBAMA and TJTO. Enhancing communication and data exchange between agencies can greatly enhance the efficacy of monitoring and prosecution efforts (Milaré 2015). This would involve creating comprehensive case management systems that enable the ongoing and thorough monitoring of environmental violations from the first discovery to the ultimate resolution.

Furthermore, it is crucial to provide ongoing training for monitoring and judiciary professionals to ensure that they possess the necessary skills and knowledge to effectively handle the intricacies of environmental matters (Fearnside 2017). Specialized training programs focused on the implementation of environmental legislation, methodologies for gathering evidence, and the utilization of monitoring technologies have the potential to enhance the efficiency and efficacy of monitoring and legal proceedings.

The development of comprehensive environmental restoration strategies is crucial. These policies should incorporate strategies to rehabilitate deteriorated places, foster enduring sustainability, and establish mechanisms to hold perpetrators responsible for inflicting harm. Close coordination between IBAMA, TJTO, and other relevant entities, such as non-governmental organizations and local communities, might boost the success of environmental recovery policies (Fearnside 2017).

Summarizing these, the answer to the leading question reveals an intricate connection between the notifications of violations given by IBAMA and the legal procedures in TJTO. The discovered inverse association between these factors might indicate that the efficacy of administrative penalties and the constrained capability of the court system have a substantial influence on the quantity of legal proceedings. To conclusively verify or disprove the original theory, additional research is required, which entails conducting more comprehensive analyses of supplementary factors and individual case studies.

Therefore, the coordination between IBAMA and TJTO cannot be exaggerated. Effective monitoring and prosecution of environmental offences in Tocantins relies heavily on close coordination and efficient data integration, which might not be currently efficient. To safeguard natural resources and advance sustainability in the Legal Amazon, it is crucial to allocate resources towards monitoring technology, provide ongoing training for experts involved, and establish strong public regulations.

Effective management of the environment in Tocantins and the Legal Amazon region relies on a comprehensive and cooperative strategy. This study offers an initial data analysis that highlights the need to develop more efficient public policies and enhance environmental governance in the area. Effective environmental governance in Tocantins and the Legal Amazon region relies on strong collaboration between monitoring agencies and the judiciary, as well as the efficient utilization of monitoring and analysis tools.

REFERENCES

- Barlow, J., Lennox, G. D., Ferreira, J., Berenguer, E., Lees, A. C., Nally, R. M. & Gardner, T. A. (2016). Anthropogenic disturbance in tropical forests can double biodiversity loss from deforestation. *Nature*, 535(7610), 144-147.
- Cruz, D C D., Beñayas, J M R., Ferreira, G C., Santos, S R., & Schwartz, G. (2020). An overview of forest loss and restoration in the Brazilian Amazon. *New Forests*, 52(1), 1-16. <https://doi.org/10.1007/s11056-020-09777-3>.
- Fearnside, P. M. (2017). Deforestation of the Brazilian Amazon. In *Oxford Research Encyclopedia of Environmental Science*. <https://doi.org/10.1093/acrefore/9780199389414.013.102>
- Garcia, M. (2018). The Impact of Illegal Mining in the Amazon. *Environmental Studies Journal*, 29(4), 198-210.
- IBAMA. (2023). *Dados Abertos sobre Autos de Infração*. Available at: <https://dados.gov.br/dados/conjuntos-dados/fiscalizacao-auto-de-infracao>.
- Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio). (2022). *Relatório Anual de Atividades*. Brasília: ICMBio.
- Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a Definition of Mixed Methods Research. *Journal of Mixed Methods Research*, 1(2), 112–133. <https://doi.org/10.1177/1558689806298224>

Lieberman, E. S. (2005). Nested Analysis as a Mixed-Method Strategy for Comparative Research. *American Political Science Review*, 99(03), 435–452. <https://doi.org/10.1017/S0003055405051762>

Machado, P. A. L. (2016). *Direito Ambiental Brasileiro*. Malheiros Editores.

Ministério do Meio Ambiente (MMA). (2020). *Política Nacional do Meio Ambiente*. Brasília: MMA.

Milaré, É. (2015). *Direito do Ambiente*. 10ª ed. São Paulo: Editora Revista dos Tribunais.

RStudio Team (2020). *RStudio: Integrated Development for R*. RStudio, PBC, Boston, MA URL <http://www.rstudio.com/>.

Silva, J. A. (2010). *Direito Ambiental Constitucional*. 8ª ed. São Paulo: Malheiros Editores.

Sposito, I. B. (2024). Introdução Aos Métodos De Pesquisa Em Relações Internacionais. Palmas, TO: EdUFT. Retrieved from <https://sistemas.uft.edu.br/periodicos/index.php/editora/issue/view/792>

Tribunal de Justiça do Estado do Tocantins (TJTO). (2023). *Datajud: Processos de Crimes Ambientais*. Available at: <https://www.cnj.jus.br/sistemas/datajud/>

United Nations. (2015). *Transforming our world: the 2030 Agenda for Sustainable Development*. Disponível em: <https://sdgs.un.org/2030agenda>