



Water pollution in the Amazon and the challenges of environmental jurisdictional protection: limits and possibilities of collective proceedings

Water pollution in the Amazon and the challenges of environmental jurisdictional protection: limits and possibilities of the collective process

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SUMMARY

Water pollution in the Amazon goes beyond the environmental dimension: it affects ecosystems, threatens traditional and indigenous communities, and undermines fundamental rights. Mercury contamination of rivers from illegal mining poses a direct risk to public health, food security, and the continuation of cultural practices deeply linked to water. This situation results from predatory exploitation, combined with institutional neglect and the absence of effective public policies. The difficulty in holding polluters accountable, the slow pace of legal proceedings, and the disconnect between legal decisions and local realities deepen the crisis.

Furthermore, the scarcity of reliable data and weak environmental monitoring keep these communities marginalized from government priorities. The research sought to understand how this pollution establishes itself and persists in the Amazon region, exploring its social, environmental, and legal impacts. To this end, the study reviewed publications from 2020 to 2025, selecting texts directly related to the subject. Using a qualitative, more descriptive, and exploratory method, the research revealed not only the existing obstacles but also some possible paths for collective action to have real impact on environmental protection. The results suggest that addressing this situation cannot be resolved through isolated measures: it is necessary to combine science, legal action, and the participation of the communities themselves. Only in this way can concrete protection be provided to those affected and the Amazon maintained its recognition as a natural and cultural heritage of global value.

Keywords: Amazon; Traditional communities; Fundamental rights; Illegal mining; Environmental justice; Water pollution; Public health.

ABSTRACT

Water pollution in the Amazon goes beyond an environmental issue: it affects ecosystems, threatens traditional and Indigenous communities, and undermines fundamental rights. Mercury contamination from illegal mining poses serious risks to public health, food security, and the preservation of cultural practices deeply connected to rivers. This scenario reflects predatory economic exploitation, institutional shortcomings, and the lack of effective public policies.

Challenges such as the difficulty of holding polluters accountable, the slowness of judicial processes, and the gap between court decisions and local realities intensify the crisis.

Furthermore, the scarcity of reliable data and weak environmental monitoring reinforces the marginalization of riverside and Indigenous populations. This study sought to understand how water pollution in the Amazon is established and perpetuated, analyzing its social, environmental, and legal impacts. To achieve this, a qualitative, exploratory, and descriptive approach was adopted, based on literature published between 2020 and 2025. The results indicate that overcoming this problem requires integrated strategies that combine scientific evidence, legal action, and active participation of local communities. Only through this approach will it be possible to ensure effective protection for affected populations and maintain the Amazon as a natural and cultural heritage of global relevance.

Keywords: Amazon; Environmental justice; Fundamental rights; Illegal mining; public health; Traditional communities; Water pollution.

INTRODUCTION

Water contamination in the Amazon is one of the biggest socio-environmental challenges in the world. Brazil. It's not just about environmental degradation, but an issue that affects human rights. essential human beings, affecting riverside and indigenous populations that directly depend on the rivers to survive. The advance of illegal mining, combined with the lack of effective monitoring and the fragility of public policies, has increased the presence of mercury in waterways, compromising ecosystems, public health and traditional ways of life.

The relevance of the topic increases given the strategic role of the Amazon, the largest reserve of freshwater and biodiversity on the planet, fundamental for global climate regulation. In this sense, water degradation goes beyond the environmental dimension, reaching social aspects, cultural and economic, and highlights the need for more consistent responses.

Among the most critical effects is the risk to collective health, especially due to the ingestion of fish contaminated with mercury, which affects pregnant women and children more severely, more vulnerable to bioaccumulation. In addition to providing food, fishing represents an economic base and cultural for Amazonian communities, so that its contamination causes insecurity feeding and weakening of collective identity.

In the legal field, although there are mechanisms such as Public Civil Action and decisions injunctions, practical effectiveness is still limited by the slowness of the processes, the absence of adequate monitoring and the distance between judicial determinations and reality experienced by the affected populations. This context emphasizes the pressing need for protection environmental jurisdiction that is structured, integrated and linked to regional demands.

In addition to assigning responsibilities to specific individuals, it is essential to create integrated public policies, based on scientific knowledge and the participation of impacted communities. River degradation is not an isolated problem, but rather as a consequence of a historical process of predatory exploitation, inequalities social and absence of the State, elements that maintain exclusion and vulnerability in perpetuity.

Finally, it is important to recognize that the protection of Amazonian waters goes beyond national limits and has international relevance, given its influence on climate regulation and the preservation of global biodiversity. Thus, this research seeks to analyze, based on



literature review, the main factors related to water pollution in the region, discussing limits and possibilities of environmental jurisdictional protection as a collective tool and structuring to tackle environmental violations.

THEORETICAL FRAMEWORK

Water pollution in the Amazon is one of the main environmental challenges and social issues of today, revealing itself as a problem that goes beyond ecological degradation and reaches public health, cultural, and legal dimensions. The indiscriminate use of mercury in illegal mining and the absence of effective control policies intensify a scenario of vulnerability, in which contaminated rivers compromise biodiversity and threaten directly the subsistence of traditional communities whose main source of income is fish of food and income.

Basta et al. (2023) explain that mercury contamination results in serious risks neurological and cardiovascular, especially due to the bioaccumulation of this substance in the fish consumed daily by the Amazonian population. Paiva et al. (2025) reinforce this analysis when observing that the effects of pollution do not affect the entire society, but are concentrated in indigenous and riverine peoples who depend almost exclusively from rivers, living in a situation of vulnerability amplified by the difficulty access to health services.

In addition to biological impacts, the degradation of water resources compromises social and cultural dimensions that structure community life. Costa and Costa (2023) highlight that mercury pollution affects traditional practices linked to the river, affecting not only the food security, but also identity and spiritual aspects. Rodrigues et al. (2024) add that illegal mining is one of the main factors of contamination, impacting directly the rights of the Yanomami people, whose physical and cultural survival depends on integrity of the water they consume and use in their daily practices.

Institutional reports also reinforce the severity of the situation. The World Wide Fund for Nature (2023) shows that the impacts of mercury contamination require measures coordinated between governments, civil society and international cooperation, since it is of an issue that transcends borders and requires regional planning. In the same direction, the Oswaldo Cruz Foundation (2023) warns that mercury levels detected in fish in the region exceed internationally accepted safety limits, creating a critical situation of

public health that needs to be addressed through preventive and monitoring policies continuous.

Thus, the literature shows that water pollution in the Amazon is a phenomenon multifaceted, which cannot be reduced to a technical analysis of environmental impact, but must be understood as a process that articulates ecological degradation, social vulnerability and violation of rights. This initial understanding allows us to move forward with a reflection on how the law and legal instruments have responded – or failed to respond – to this challenge.

Tackling water pollution in the Amazon requires not only diagnostics environmental and health issues, but also a consistent legal response, capable of articulating collective mechanisms of accountability and protection of diffuse rights. The degradation caused by mercury contamination, in particular, highlights the limitations of state action and the challenges of implementing environmental jurisdictional protection, which should guarantee both repairing the damage and preventing new impacts.

The Federal Public Ministry (2023) has been crucial in defending the environment in Amazon. In this sense, the use of public civil actions has been frequent, which have become a important instrument for accountability and obtaining urgent measures in cases of damage to the environment. A concrete example of this action is in the initial document of the Public Civil Action No. 1012197-54.2022.4.01.3000, where the body explains how the process collective can be used to address issues of great relevance. More than trying contain pollution, the initiative seeks to strengthen the legal protection of the Amazon and call attention to the need for structural responses. This movement gains even more relevance in the Legal Amazon, where oversight is often insufficient, allowing that polluting practices are perpetuated and worsen environmental degradation.

The Climate Observatory (2024) adds to this debate the analysis of judicial decisions injunctions that have sought to impose limits on activities that pose an immediate risk to environmental balance. The entity notes that, although these measures represent advances in damage containment, they still encounter barriers in practical effectiveness, whether due to fragility of monitoring institutions, or due to pressure from local and global economic interests.

In the same direction, Lago (2025) argues that the recognition of a “state of affairs environmental unconstitutionality” can be a fundamental instrument to face the persistent violation of socio-environmental rights in the Amazon. The author argues that judicialization structural is necessary given the State's historical inability to guarantee effective protection, pointing out that only through judicial decisions with transformative force will it be possible reverse the systemic degradation situation.

In turn, Farias, Almeida and Brito (2025) show, based on the analysis of the Program Amazônia Protege, that the accountability of deforesters and polluters faces obstacles in application of sanctions, which creates a feeling of impunity and reduces the pedagogical scope of measures. For the authors, the inconsistency in compliance with penalties highlights the need for greater coordination between the Judiciary, the Public Prosecutor's Office and the regulatory bodies environmental inspection, in order to make collective protection more effective.

These studies show that the collective process, although essential for the protection environmental protection in the Amazon, still faces serious institutional, political and structural. The literature indicates that, without more robust procedural mechanisms and decisions judicial measures that face the complexity of the problem, judicial protection will remain unable to contain water pollution that threatens ecosystems and traditional communities of region.

Despite regulatory advances and the use of instruments such as public civil action, there are still numerous obstacles to making environmental jurisdictional protection effective in Amazon. Water pollution, especially that associated with the use of mercury, exposes the weaknesses of the inspection system and the difficulty in reconciling economic interests with environmental protection. The result is a picture of continuous degradation that is not limited to the ecological field, but reaches social, cultural and legal dimensions.

The Climate Observatory (2024) highlights that many preliminary court decisions have managed to impose immediate restrictions on polluting activities. However, these measures are often insufficient in view of the slowness of the process and the lack of capacity of the oversight bodies to monitor compliance with the determinations. This discrepancy between the judicial decision and its practical effectiveness weakens confidence in the collective process as instrument of structural transformation.

Lago (2025) notes that the notion of "environmental unconstitutional state of affairs" appears as a way out given the limited effectiveness of the measures already implemented. For him, the environmental violations in the Amazon cannot be seen as isolated facts, but as part of a structural situation that repeats itself and worsens. This reading shows the importance of a more firm judicial action, which goes beyond repairing specific damages. The author argues that decisions of this kind need to create ongoing obligations of protection and put pressure on the State to adopt public policies in an articulated and lasting manner.

The difficulty in ensuring the effectiveness of environmental protection is also related to the how sanctions are applied. Farias, Almeida and Brito (2025) demonstrate that, in the case of environmental crimes and polluting practices, the penalties imposed are often not

materialize, generating a sense of impunity and discouragement of legal compliance. For the authors, without a collective effort of integration between the Judiciary, Public Ministry and agencies environmental, the collective process tends to remain limited in its potential for transformation.

More broadly, the literature indicates that tackling water pollution in the Amazon requires understanding that the problem is not just legal or technical, but structural. It is of a phenomenon that involves social inequality, vulnerability of traditional populations and global economic pressures. Thus, strengthening environmental jurisdictional protection for measures that combine the judicial accountability of offenders with the implementation of policies integrated and culturally sensitive public policies. This is the path indicated by studies as essential to ensure that legal protection is not restricted to paper, but translates into real improvements for Amazonian rivers, ecosystems and communities.

METHODOLOGY

This study is characterized as a qualitative research, of a exploratory and descriptive, constructed from bibliographic and documentary analysis of articles scientific, institutional reports, court decisions and academic works published between 2023 and 2025. The time frame was defined with the purpose of including recent productions and relevant, which directly address the problem of water pollution in the Amazon, its socio-environmental impacts and the legal challenges in the collective protection of diffuse rights. The the choice of the qualitative approach is justified by the complexity of the topic, which cannot be reduced to numerical data, but requires a critical understanding of the interactions between degradation environmental, public health, social vulnerability and the role of legal institutions.

The sources used present distinct but complementary perspectives. The works of Basta et al. (2023) and Paiva et al. (2025) bring the toxicological and epidemiological dimension, examining the health risks of riverside populations exposed to fish consumption contaminated by mercury. Costa and Costa (2023) and Rodrigues et al. (2024) contribute reflections focused on the social and cultural effects of this pollution, addressing everything from degradation of aquatic biodiversity to direct consequences for indigenous peoples and traditional communities, such as the Yanomami. The World Wide Fund's technical reports for Nature (2023) and the Oswaldo Cruz Foundation (2023) present empirical evidence that confirm the severity of the contamination and warn of the lack of public policies capable of mitigate the impacts.

In the legal and institutional field, Farias, Almeida and Brito (2025) discuss the holding illegal deforesters accountable through the Amazônia Protege Program, expanding the reflection on the effectiveness of sanctions in cases of major environmental damage scale. Complementing this analysis, the Federal Public Ministry (2023) demonstrates, through of the initial petition of Public Civil Action No. 1012197-54.2022.4.01.3000, as the process collective can be used as an instrument to combat water degradation. From Likewise, the preliminary decision of the Climate Observatory (2024) reveals the importance of Power Judiciary in the imposition of emergency environmental protection measures. Finally, Lago (2025) contributes with a theoretical reflection on the notion of “unconstitutional state of affairs environmental”, which presents itself as an alternative to deal with structural violations that are not solved by specific measures.

The methodological procedure was organized into three main stages. In the first, the bibliographic and documentary sources were surveyed and sorted, with the following inclusion criteria: thematic relevance to the research object, publication between 2023 and 2025, relevance to the legal-environmental debate and focus on the Amazonian context. The objective of this phase was to ensure that the material analyzed was cohesive and recent, avoiding repetitions and ensuring a variety of viewpoints.

In the second phase, a critical and comparative analysis of the selected works was carried out, emphasizing the commonalities and differences in relation to identifying the causes of water pollution, the description of environmental and social damage and the effectiveness of legal responses available. This process made it possible to observe that, although there is consensus on the severity of the mercury contamination and the vulnerability of local communities still persist significant divergences regarding coping strategies and the adequacy of procedural tools used in Brazil.

In the third stage, the results of the analysis were systematized into analytical categories which served as a basis for discussion. These categories were defined based on the recurrence thematic in the sources and include: (i) the environmental and health impacts resulting from pollution water pollution by mercury; (ii) the social, cultural and economic impacts on indigenous peoples, riverside communities and traditional communities; (iii) institutional action, with emphasis on the Public Prosecutor's Office and collective actions as instruments of environmental defense; and (iv) the limits and possibilities of environmental jurisdictional protection, considering the need for decisions structuring and integrated public policies.

The analysis technique adopted was the category-oriented literature review themes, which allowed not only describing the contents of the sources, but also articulating

a critical interpretation of how science, society and law interconnect in tackling Amazonian water pollution. Thus, we sought to build a panorama that highlight both the weaknesses and the potential of the collective process as a means of protection of environmental rights.

As this is a bibliographic and documentary study, there was no data collection. primary or direct contact with research subjects. All material analyzed corresponds to secondary data already published, duly systematized and referenced in accordance with the ABNT standards. This methodological choice reinforces the scientific validity of the study and enables its replicability in future investigations into the effectiveness of guardianship environmental jurisdiction in the Amazon.

RESULTS AND DISCUSSION

Analysis of the set of references demonstrates that water pollution in the Amazon is not can be understood as a one-off event or restricted to specific communities, but as a structural process that articulates environmental, social, legal and institutional dimensions. The mercury contamination, mainly from illegal mining, exemplifies the depth of the problem, affecting both biodiversity and the health of populations humans. Basta et al. (2023) and Paiva et al. (2025) demonstrate that fish intake contaminated constitutes the main form of exposure to the metal, causing severe effects to health, particularly in pregnant women and children.

The Oswaldo Cruz Foundation (2023) highlights this concern by stating that the exhibition chronic disease continues to be not evidenced in official statistics, which makes it difficult to development of effective preventive policies. This set of analyses allows us to see that the environmental degradation in the Amazon is also a public health issue, the severity of which is systematically neglected by state power.

In the socio-environmental field, Costa and Costa (2023) and Rodrigues et al. (2024) highlight that the impacts of contamination go beyond physical health. Contaminated fishing compromises subsistence of riverside families and threatens the cultural basis of peoples such as the Yanomami, who depend on the integrity of rivers to maintain their identity and way of life. The World Wide Fund for Nature (2023) shows that the absence of regional mitigation plans not only worsens the damage already caused, as well as perpetuating a cycle of degradation that weakens local communities. In this sense, water pollution should be understood as a



form of environmental injustice, in which historically marginalized populations are the ones who suffer the most suffer the consequences of degradation.

From a legal perspective, there is an attempt to construct responses through the collective process. The Federal Public Ministry (2023), when filing the Public Civil Action No. 1012197-54.2022.4.01.3000, highlights how judicial protection can be mobilized to hold polluters accountable and demand emergency containment measures. The Observatory do Clima (2024) reinforces this reading when analyzing preliminary decisions in licensing cases environmental, in which the Judiciary acts as an urgent instance in the face of the inefficiency of the Executive. However, Farias, Almeida and Brito (2025) show that the punishment of offenders environmental issues in the Amazon still face significant barriers: the slowness of processes, the lack of monitoring and the persistence of a culture of impunity limit the scope practical application of judicial decisions, often making them more symbolic than effective.

Given the persistence of these failures, Lago (2025) defends the need to recognize the existence of an “unconstitutional environmental state of affairs”, that is, the characterization of continuous degradation as a structural situation of unconstitutionality. This proposal implies shifting judicial action from a reactive logic, aimed at repairing isolated damages, for a structural logic, capable of imposing lasting obligations on the State and demanding policies consistent public policies. At the same time, this perspective points to the need to integrate science, society and law in an articulated approach, since pollution problems water resources exceed the response capacity of a single sector.

In convergence, the authors analyzed indicate that water pollution in the Amazon results from a set of intertwined factors, including the expansion of mining, the insufficient public policies, weak oversight and slow responses judicial. The differences appear in the way of confrontation: while institutions such as the Federal Public Ministry (2023) emphasize the role of the collective process as an instrument of accountability, Lago (2025) and Rodrigues et al. (2024) advocate structural approaches, which combine legal action with preventive policies of an intersectoral nature. This diversity of perspectives reinforces the need for strategies that unite environmental, social dimensions and legal in the search for effective solutions.

In summary, the literature findings reveal that water pollution in the Amazon presents multiple facets, being fueled by predatory economic dynamics, by institutional gaps and the limited effectiveness of current legal responses. Confrontation this situation requires integrated and continuous public policies, based on evidence scientific, articulated with firm judicial decisions and aimed at effective accountability

of polluting agents. The effectiveness of environmental jurisdictional protection will be conditioned on the ability to integrate science, law and social participation in a long-term perspective, capable of ensuring the preservation of the Amazon and the dignity of its populations depend.

FINAL CONSIDERATIONS

The analysis presented in this article demonstrates that water pollution in the Amazon constitutes a structural and multifaceted phenomenon, supported by predatory economic practices, institutional weaknesses and long-standing social inequalities. Although the country has legal resources aimed at environmental protection, the implementation of these instruments still encounters difficulties, ranging from the lack of effective public policies to the persistent impunity of the agents responsible for the degradation of rivers.

It has been found that mercury pollution not only causes harm to the environment environment, but also constitutes an effective risk to collective health, mainly impacting traditional and indigenous communities that depend on fishing activities as a basis of their food and cultural identity. The lack of organized data and a constant monitoring accentuates the invisibility of the problem, making it difficult to include as a priority on the political agenda and highlighting the limited relevance of the Amazon in national environmental conservation policies.

The effects of water pollution are not limited to riverside communities. They also exert influence on urban areas, altering old social weaknesses and cultural. Families that had fishing as their main source of income, upon losing this activity, are inserted into new cycles of exclusion, which intensifies inequalities regional and strengthens socio-environmental injustice. Therefore, the contamination of Amazonian rivers must be understood not only as an environmental issue, but also as a problem that directly affects essential human rights, such as health, food and dignity.

From a legal point of view, environmental safeguards face considerable challenges. limitation. Although the relevance of public civil actions and preliminary measures are fundamental, their practical effectiveness is hampered by the slowness of judicial processes, by lack of monitoring of decisions and the disparity between judicial decisions and the reality experienced by the impacted communities. This statement emphasizes the urgency of adopt a structural perspective, in which the action of the Judiciary is connected to public policies permanent and integrated, capable of confronting degradation in its entirety.

In this regard, it becomes essential to develop integrated strategies that integrate science, legislation, and public engagement. Strengthening communication between public institutions, communities and civil organizations should guide policies that integrate prevention, repair and mitigation, emphasizing the cultural diversity of the locality. The peoples of the Amazon should not be considered only as victims, but as protagonists in developing solutions for the preservation of rivers and forests.

Ultimately, preserving the Amazon in the face of resource contamination water resources must be considered an ethical, social and legal imperative that goes beyond limits territorial. The goal is to ensure that the most important water heritage on the planet continues to sustain lives, cultures and ecosystems, with direct effects on the regulation of climate and the conservation of global biodiversity. Due to its global importance, the protection of the Amazon must be seen as a collective responsibility, demanding collaboration international and the formation of a legal support that transcends individual actions, becoming an authentic mechanism of environmental and socio-environmental justice sustainable.

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