



Judicial expertise and its application to environmental crime in Ecuador

Peritaje judicial y su aplicación en el delito ambiental en Ecuador

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Abstract

Environmental matters require imminent action by expert assessment to establish responsibilities and define judicial procedures. It is essential to know which factors have a legally relevant influence in determining environmental crime. The objective of the research is to analyze the judicial expertise from the perspective of environmental crime. It is supported by the review and analysis of scientific documents, from specialized databases, with the aim of identifying aspects that allow focusing attention on the need to integrate legal guidelines on environmental crimes that limit the sustainable development of the territories. It is concluded that the existence of a judicial expert opinion leads to the need to mediate, negotiate or settle matters or facts in accordance with the law, where the human being acts as a scientific technician with evidentiary training.

Keywords: Judicial Expertise; Environmental Crime; Environmental legislation; Environmental Conflicts; Administrative Authorities

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Resumen

Lo ambiental requiere una actuación inminente de la valoración de expertos para el establecimiento de responsabilidades y la definición de procedimientos judiciales, resulta fundamental conocer cuáles son los factores que influyen legalmente de forma relevante para la determinación del delito ambiental. Se precisa como objetivo de la investigación analizar el peritaje judicial desde la perspectiva del delito ambiental. Se apoya en la revisión y análisis de documentos científicos, precedentes de bases de datos especializadas, con la finalidad de identificar aspectos que permitan centrar la atención en la necesidad de integrar lineamientos legales sobre delitos ambientales que limitan el desarrollo sostenible de los territorios. Se concluye que la existencia de un peritaje judicial conlleva a la necesidad de mediar, negociar o dirimir asuntos o hechos apegados al derecho, donde el ser humano actúa como técnico científico con entrenamiento probatorio.

Palabras clave: Peritaje Judicial; Delito Ambiental; Legislación Ambiental; Conflictos Ambientales; Autoridades Administrativas

Introduction

The judicial expertise requires useful information on which to support decisions to sustain sentences. The same is supported by a report made by professionals to know the margin of information on some environmental fact, it requires to locate of exact records on questions developed by judges, that is to say to indicate questions presented by a judge, so that it is possible to have knowledge capable to dictate a sentence, in which to sustain or to support the decisional process.

The expert opinion, is a means that is represented by an evidence report that provides timely and valid information for the judicial proceeding, in which facts or circumstances of evidentiary nature are highlighted (Duce, 2011), specifically it is an exposition made verbally or in writing. In view of these approaches, the intervention of an expert in a categorical period is relevant; giving special importance to written communication and oratory, as a fundamental part of the expertise (Rodriguez, 2010), it is conclusive to differentiate the judicial expertise, expert and expert opinion, this differentiation becomes imperative in the face of collapsed and restricted environmental crimes, where the rationalization of decision making and efficiency, is essential.

The establishment of these differentiations becomes essential for the search of a scientific method that validates the creation of a public conscience on judicial expertise in different countries and at an international level, in this sense, the establishment of theoretical and scientific frontiers, highlight the importance of fighting with decision the harmful and dangerous actions against the environment and nature, using, among others, the means and regulations provided by law through its normative expressions such as the Constitution and the particular environmental laws.

There are many faults that human beings and organizations commit against the environment, to such an extreme that the ways of relating human beings with nature have been transformed, that in the juridical field they have propitiated the appearance of human rights of third and fourth generation, or 21st century rights, referring not only to living in a healthy and balanced environment, but also to the fact that nature, traditionally considered as an object of rights and a source of resources for the satisfaction of human needs, has also become a subject of rights as a result of this re-dimensioning.

From a generic perspective, the tendency of an environmental ecology, marked by anthropocentrism, considers that the idea that nature must be preserved only in terms of human beings as the exclusive and privileged holder of rights over it, is already in the past, by granting nature the category of subject of the rights that the 2008 Ecuadorian Constitution grants it.

The Political Constitution of Ecuador of 2008 (EC) and the Constitution of the Plurinational State of Bolivia of 2009 (BC 2009), supported by the innovative guidelines of the new Latin American constitutionalism, legalized from the ancestral traditions of the Andean indigenous cosmovision, refer to an antagonistic form of the relationship of human beings with their environment, called *sumak kawsay* or also good living, which radically distances itself from the anthropocentric position, since it is not about the community limited to humans, but about the community of all living things. Consequently, indirectly in Bolivia and expressly in Ecuador, nature is recognized as a subject of rights (Pinto, 2017).

In this order of ideas, the research aims to analyze the judicial expertise from the perspective of environmental crime, specifically to describe the historical path of the judicial expertise and identify the essential elements from the constitutional and legal guidelines of Ecuador for the analysis from an extended vision of the judicial expertise.

The methodology used was selected from its organization and development, selected methods were used for the theoretical research in juridical sciences, specifically the interpretative, deductive, historical-logical, making use of the hermeneutic method for the analysis of the legal-constitutional norms of the rights of nature and from those juridical guidelines the establishment of a judicial expertise that determines faults and deficiencies on the environmental.

Likewise, as a research technique, content analysis was used, applied especially to the analysis of legal documents and specialized studies, legal provisions, and non-legal documents, such as reports from national or foreign institutions and information published in different Ecuadorian media, in all cases texts related to judicial expertise and environmental crimes.

1. Judicial expertise: Brief historical references

For the understanding of the genesis of the idea of expertise, from the linguistic point of view, conditions are created to establish differentiations on several terms involved in it. According to the dictionary of the Royal Spanish Academy, the expression expert,

comes from the Latin *perītus* which means connoisseur, or dexterous, corresponds to the expert or knowledgeable in some object. In this sense, the word expertise comes from the Latin *peritia*, which means knowledge, experience, license, skill or talent, that is to say, in concrete terms, expertise refers to the wisdom that is developed from practice, which exposes the experience and skill in a science or art (Picard and Useche, 2005).

Under this perspective, the term expertise is a modification of the base word by means of the suffix *-aje*, forming the noun that expresses the action, and whose close synonym is *expertise*, which refers to the work or study done by an expert. In the discussion of the analysis of these definitions, a common and similar element underlies the special knowledge, which differentiates the one who holds it by the procedures and responsibilities with certain expertise.

From the point of view of the legal doctrine, Dall'anese (2002), points out that in the definition of expert, he refers to the person who performs in the judicial field, that is to say, he is an auxiliary of justice, who through the exercise of the public function or also of his private activity, it is essential to issue an opinion on elements referred to his science or practice, which, his fundamental role is the advice and orientation to the diverse judges.

One of the essential characteristics of the expert is that they have special and diverse knowledge, in this sense, there is a recognition of the participation and involvement of the experts. From a historical-legal point of view, in the process of inquiry, the recognition of the expert in the normative system is linked to the specialized knowledge and the contribution of physical or material elements, if it is located in historical stages the expert opinion existed since the Classical Roman law as well as in the jurisprudential law (100 to 50 B.C.), in Rome, the figure of the "jurisperito" stood out, referred to perform expert work under consultancies to magistrates, judges and individuals.

2. Legal configuration of the rights of nature: Essential elements for its analysis from an extended vision of expertise.

In Ecuador, nature is a subject of rights, as was established in the Constitution of the Republic of Ecuador (2008), by decision of the National Constituent Assembly; this quality in terms of legal dogmatics implies the possibility of exercising rights and contracting obligations, acting in court by itself or through third parties by way of representation and, in general, doing everything that is not prohibited by law. This is an indisputable thesis in modern law, especially because it is based on the unquestioned assumption that only human beings can be subjects of rights, either individually or through legal or collective persons, thus rights always refer to persons as their holders.

The fact that nature has been granted the quality of subject of rights has generated an abundant literature in Ecuador and abroad; the novelty denotes precisely that fact, without a rigorous analysis of the theoretical and practical implications of the fact, beyond some essays and general references that lack scientific rigor.

One of the logical consequences deriving from the recognition of the new subject of rights is that, also by means of a political decision of the competent authority, it must be specified which rights it has and in what way, within the limits, it could exercise them; there are few studies that exhaustively analyze the technical legal characteristics of the rights recognized to nature, apart from marginal comments to reinforce the arguments that sustain its quality of subject of rights and that jurists maintain different interpretations (Kriskovich, 2007).

These shortcomings have negative repercussions both at the legislative and jurisprudential levels, as well as on the necessary formation of environmental awareness and a culture of respect, protection of the rights of nature and determination of environmental crimes, because if beyond rhetoric and good wishes there is no explanation of what these rights consist of and what their content and scope are, they could hardly be properly protected and guaranteed in the different instances of public or private decision making or by the citizenship in general.

In spite of the much praised novelty of the rights of nature, in the Constitution of the Republic of Ecuador, the rights granted to them are really scarce, both in quantity and in the precise establishment of their internal and external limits of their scope and content, which should be developed by secondary legislation or, as proposed by an assembly member in the constituent assembly, through an organic law on the rights of nature. To go into the subject it is necessary to begin with the analysis of the article of the Constitution of the Republic of Ecuador in which nature is attributed the quality of subject of rights, in this order of rights, is that the experts will take referential information for the legal opinion and the suggestions and advice to the judges.

Article. Individuals, communities, peoples, nationalities and collectives are holders and shall enjoy the rights guaranteed in the Constitution and international instruments. Nature shall be the subject of those rights recognized by the Constitution (italics not in the original).

In an exhaustive manner, it denies what is repeated ad nauseam in some studies on the subject that refers to the rights of nature, which are not at the same level, are not equal, do not have the same meaning as the rights of the other subjects provided for in article 10; the difference lies in the constituent mode to individual or collective subjects constituted by human beings, the first are holders of rights, while the second is subject to the rights that are recognized in the Constitution.

The difference is not only terminological, but involves important theoretical and practical consequences, being a holder of rights denotes the fact that these rights are held, regardless of whether or not they are recognized by the authority. One is in possession of the title that confers legitimacy to exercise the rights that correspond according to the condition of the subject; on the contrary, nature is not a holder of rights but a subject whose rights are contracted to those recognized by the Constitution of the Republic of Ecuador.

Another important consequence, which derives from the distinction between holders and subjects of rights, is related to the question of whether the principles of application

of human rights established in Article 11 of the Constitution of the Republic of Ecuador, which also works for the application of the rights of nature. With certainty, it could be said that the only one of the principles applicable is the one provided for in clause 11, according to which "the content of the rights shall be developed progressively through norms, jurisprudence and public policies." The others would only be applicable to rights holders, subjects other than nature.

After the debates in the National Constituent Assembly and the approval of the final text, the rights of nature were established in two articles: Article 71. Nature or Pacha Mama, where life is reproduced and realized, has the right to full respect for its existence and the maintenance and regeneration of its vital cycles, structure, functions and evolutionary processes. Any person, community, people or nationality may demand from the public authority the fulfillment of the rights of nature (*italics omitted*).

Article 72. Nature has the right to restoration. This restoration shall be independent of the obligation of the State and natural or juridical persons to compensate the individuals and collectives that depend on the affected natural systems. This is the literal text of the articles where the rights are established in their pertinent part, the rest refers to the principles of interpretation and application, the obligations of the State and the subjects legitimized to act on behalf of nature. According to the text, nature is recognized as having three rights: i) to have its existence fully respected; ii) to respect the maintenance and regeneration of its vital cycles, structure, functions and evolutionary processes; and iii) the right to restoration.

The first two require an abstentionist attitude, as passive subjects, from the rest of the subjects of law such as the State, public and private economic agents and society in general: the basic requirement would be that it is forbidden to carry out any action or omission that could affect the integral existence of nature or its vital cycles. The difficulty lies in the fact that there is no unitary, individual or individualizable subject that can be identified as "nature" as an active subject.

The third obliges as passive subjects those who are found responsible for causing damage to nature to restore it; when the environmental impact or damage caused is serious or permanent, it is up to the State to establish the most effective mechanisms to achieve restoration, and to adopt adequate measures to eliminate or mitigate the harmful environmental consequences, thus satisfying nature's right to its restoration.

If a separation is made between man and nature, or even situating man as part of nature and living in harmony with it, any action or omission he makes, even to ensure its existence, affects the second of the recognized rights: if man were in danger of contracting a serious disease as a consequence of insect bites, and decides to eliminate some of them, he would affect the maintenance and regeneration of the vital cycles of nature, or at least that of each of the eliminated insects or of his species in general. Hence, the content of the first two rights is almost impossible to satisfy literally, since the underlying rule demands an absolute non-doing that is unfeasible even for the most hardened environmentalist.

As for the right to restoration, despite its apparent coherence with the previous two, it logically implies their violation: for example, when operations begin in an open-pit mine it is obvious that the rights recognized in article 71 will be violated; as compensation to nature, article 72 recognizes its right to restoration, which in practice translates into an annulment of the rights recognized in article 71, a logical contradiction that has not been noticed to date by theorists of the rights of nature, be they ecologists or professional jurists.

Of course, the literal interpretation is not the only possible way to analyze the rights of nature, and it is certainly not the most appropriate because of the perplexity it leads to in terms of logical consequences; but a systematic and coherent interpretation of the constitutional text yields something even more disturbing: the good life, understood as the realization of human rights, can only be achieved if the rights recognized to nature in article 71 are not respected and, additionally, if the right of nature to its restoration provided for in article 72 is fulfilled to the greatest extent possible.

The above conclusion raises an apparent contradiction between human rights and the rights of nature: the more the latter are respected, the less possibilities there will be of satisfying human needs, especially those whose effective enjoyment depends on the exploitation, use and commercialization of natural resources, or those which, on the contrary, require the elimination of elements of nature that may be harmful to man.

This is, in synthesis, the center of discord between those who defend the rights of nature and *sumak kawsay* to the extreme, and those who defend good living understood as the satisfaction of human rights; however, from both positions, extreme by the way, it is agreed that both *sumak kawsay* and good living must be achieved in harmony with nature and the environment. The center of the discussion is more political than juridical, although the best of the possible solutions surely passes through the promotion of "constitutional and judicial actions oriented to demand the application of the rights of nature in concrete situations, which would promote the configuration of a judicial criterion and state protection...and the development of a proper legislation of the rights of nature, which assures its autonomy, integrity and effectiveness".

Although this proposal is not meaningless in principle, since 2008 it has not materialized in a special law on the rights of nature, nor have they had a significant development or impact on the legislation subsequent to the EC regarding the exploitation, exploitation or commercialization of natural resources or environmental goods. On the contrary, there are many authors who consider that environmental legislation subsequent to the Constitution of the Republic of Ecuador in certain cases violates the rights of nature or encourages their violation.

Those rights recognized to nature as an undifferentiated totality, cannot be exercised or claimed directly if there are no specific regulations in the secondary legislation that make them operative; for this there does not seem to be a different way than the common way of proceeding in environmental legislation, that is to say through the special regulation of the specific forms of exploitation, exploitation and commercialization of concrete natural resources according to their characteristics.

In spite of the fact that nature and the environment exist as a systemic totality in which each of its biotic and abiotic elements coexist, Law as rules for the regulation of human conduct requires the identification of both the subjects and the object on which the rights and obligations arising from a juridical relationship fall; therefore, from the point of view of legislative technique, it is unfeasible to regulate in a single legal body everything related to human activity on nature as a subject, or its elements understood as natural resources exploitable by human beings.

Given this impossibility, in practice the concrete forms of interaction of man as a subject of rights with natural resources as an object are regulated separately, without losing sight of the fact that at least in theory the legal system into which the special laws are integrated should be coherent and exhaustive; under this premise, Ecuadorian environmental legislation after 2008 should be understood as a concrete form of protection of the rights of nature.

However, contrary to that hypothesis, such legislation is characterized more by what it hides than by what it says: disregarding the vague and ambiguous expressions on the protection of the rights of nature or the references that make to the EC or to good living, the special laws on environmental matters continue to treat nature, with exceptions that will be explained below, as an object and not as a subject of rights worthy of special consideration.

These limitations can be seen in the Mining Law (LM): despite the fact that it is one of the activities that most affects the environment and the rights of nature, it only contains two references to them, the first in its recital that reproduces a segment of article 319 of the Constitution of the Republic of Ecuador and the second in article 79, which establishes the obligations of the holders of mining rights to return the waters to their original sources free of contamination, "in order not to affect the constitutionally recognized rights of people and nature." The obligations related to the reparation of the damage or environmental impact caused, as well as the popular action that people can exercise to denounce mining activities that generate social, cultural or environmental impacts, can also be interpreted as a requirement of respect for the rights of nature.

Similar elliptical references to the rights of nature, without any specific regulation on the ways in which they should be respected or the non-negotiable essential nucleus in each case, can be verified in the Organic Law of the Food Sovereignty Regime (LORSA), whose articles only point out the rights of nature as an eventually persuasive criterion to be taken into account in the application of its content, or in the public policies or special laws derived from its provisions.

The rest of the laws issued from 2008 to the present applicable to environmental matters have similar characteristics to those mentioned above. As an exception can be considered the Organic Law of Water Resources and Water Uses and Development (LORHAA), which marks a different and very suggestive note in the midst of the evasive special legislation with respect to the rights of nature, by virtue of the fact that it

establishes an independent chapter where it establishes the concrete ways in which the rights of nature must be ensured with respect to water conservation, All these guidelines establish the legal elements for the judicial expertise, in the understanding that they are referents so that the expert takes as supports for the report, the established guidelines, with these indications from this investigation the judicial expertise will be carried out to the extent that legal bases are established in environmental matters for the determination of the crimes.

In this law nature, as a subject of rights, although it is understood as an undifferentiated totality, its rights are protected through the protection of water as one of its own elements; technically it is not being recognized new rights, but making operative its right to the maintenance of its vital cycles and its right to restoration, the first through the maintenance, preservation and protection of its flow, its sources and its hydrological cycles, and the second through the restoration of the damages or environmental impact caused to the surrounding ecosystems (Coria, 2008).

As a reaffirmation that the LORHAA constitutes an exception, mention can be made of the recent Organic Environmental Code (COA) which, in addition to repeating the constitutional provisions on nature as a subject of rights, the specific rights recognized, the obligations of the State and individuals and the popular action to claim for environmental damages, only contains as novelties the responsible management of fauna and urban trees.

Regarding animals, it is noteworthy that, in spite of being considered as one of the elements of nature closest to human beings and therefore one of the first for which the quality of subject of rights was claimed, they are not treated as such in the COA, since its norms have the promotion of animal welfare as an objective, through the eradication of violence against animals, the promotion of adequate treatment to avoid unnecessary suffering and prevent their mistreatment, and the application and respect of the protocols and standards derived from international instruments recognized by the State.

Criminal legislation, as a possible way to guarantee and protect the rights of nature, does not include specific provisions on the forms of action and penalties applicable to potential violators; the Comprehensive Organic Criminal Code (COIP) does not typify any crime where the protected legal good is the rights of nature; in the Fourth Chapter of the Second Book containing the Crimes against the Environment and the Pacha Mama, only those that affect the environment are typified, however, none contemplates nature as a legal good.

Animals are not protected as subjects of rights in the COIP either, since although contraventions are typified for cases of mistreatment and death of pets or companion animals, the objective is to ensure their welfare and protection and not the rights they may have as elements of nature, regulations that together with subsequent COA regulations reaffirm that animals are not subjects of rights under current legislation in Ecuador, even though they are part of nature, which is subject to rights (Alterini, 2009).

In summary, it can be said that the legal regulation of the rights of nature in post-EC laws presents several insufficiencies, which in general can be summarized in the

following notes: they present vagueness and ambiguity with respect to the determination of the protected legal good. They do not contain a concrete delimitation of the ways in which the rights of nature must be protected in the laws regulating the use, exploitation or exploitation of specific natural resources, except for the LORHAA with respect to the use and exploitation of water. They also have a fragmentary character, since the use, exploitation and exploitation of natural resources regulated in specific laws contain scattered rules, sometimes incoherent among themselves, on the ways in which the rights of nature must be protected or how the means available for this purpose must be used.

In addition, it should be noted that the protection of the rights of nature has been carried out through indirect secondary regulation: no specific law has been enacted on the subject, but rather the specific laws relating to the different natural resources include provisions, almost always of a declarative and teleological nature, on the rights of nature and its nature as a subject of rights.

Now, in order to delimit the elements that configure the rights of nature, it must be specified that these are fundamental rights for their conservation and protection; from the procedural point of view, these rights must be claimed through legal representation, since nature cannot represent itself. The active subject is undetermined and the specific sphere of the legal right to be protected must be defined by way of interpretation in administrative or judicial proceedings.

The other subjects of rights recognized in article 10 of the Constitution, such as the State, public and private institutions, organizations, communities, indigenous peoples and nationalities, and individuals, are obliged to protect the rights of nature. Its object of protection is nature as a whole, and since it is composed of a diversity of heterogeneous elements, protection extends to them as well.

The essential content of the rights recognized to nature is circumscribed to three basic aspects: its existence, its conservation and its restoration. The limits for its exercise must be determined through the systematic interpretation of the EC, taking into consideration other constitutional principles and values such as good living, *sumak kawsay*, coexistence in harmony with nature and human rights. Finally, for their defense and protection, the same means of access to justice that apply to human rights apply, since the difference between the subjects of one and the other is not relevant for the purpose of ensuring their enforcement in judicial or administrative proceedings.

In synthesis, the juridical in Ecuador, takes into consideration the rights of nature that become a referential framework for an analysis from an extended vision of the expertise, although the compiled and systematized information is key, the juridical elements raised from the constitution and laws of the countries will play a key role, in the foundation of the opinions and reports.

Materials and methods

The research was conducted using a mixed design, combining both quantitative and qualitative methods. This mixed approach allowed for a holistic and in-depth understanding of environmental crime and its implications. On the one hand, a quantitative analysis was conducted to examine the frequency, geographic distribution and other quantifiable characteristics of environmental crime in the study area. This included the analysis of statistical data and the use of geospatial tools to map the incidence of environmental crime in different regions. On the other hand, qualitative research was carried out to explore the underlying causes, socioeconomic contexts and perceptions of the actors involved in environmental crime.

The population and sample consisted of a wide range of stakeholders involved in environmental crime in the study area. This included officials from relevant government agencies, such as environmental authorities and law enforcement agencies, as well as members of local communities, environmental activists, representatives of non-governmental organizations, and environmental law professionals. In addition, the inclusion of academic and scientific experts was considered to provide specialized knowledge on issues related to environmental crime in the region.

Therefore, the sample was selected using purposive and stratified sampling methods that ensured the representativeness and diversity of the participants, which allowed for the inclusion of individuals with a wide range of perspectives and experiences related to environmental crime, as well as a variety of socioeconomic and demographic profiles; in addition, ethical considerations were taken into account to ensure the protection of the rights and confidentiality of the participants during the research process.

Specifically, the sample was limited to 30 people, composed of criminal judges and Ministry of Environment workers. This decision allowed for a more detailed and in-depth approach to the analysis of the participants' perspectives and experiences. However, priority was given to those individuals who met the specific criteria of being involved in the area of environmental law, and who had solid experience in environmental expertise, management and policy, thus ensuring the relevance and quality of the data collected. In this sense, it was ensured that all participants provided their consent to participate in the study, thus respecting their rights and guaranteeing transparency and ethics in the research.

Results

The process of judicial expertise plays a fundamental role in the resolution of environmental crimes, acting as a bridge between scientific-technical knowledge and the justice system. In the Esmeraldas Province of Ecuador, this practice faces unique challenges given the richness and vulnerability of its ecosystems. In this context, the effectiveness of judicial expertise depends not only on the legal and technical soundness of the expert opinions, but also on the training, experience and practices of the environmental experts involved. This analysis seeks to delve into the current situation of environmental judicial expertise in Esmeraldas, with the objective of

identifying its strengths and areas for improvement, thus contributing to the effective administration of justice in cases of crimes against the environment.

Thus, the data analysis focuses on analyzing the process of judicial expertise in cases of environmental crimes in the province of Esmeraldas in Ecuador, determining its effectiveness and opportunities for improvement. To achieve this, several specific objectives have been established to guide the description and characterization of the judicial expert witness process in environmental crime cases.

The first specific objective seeks to describe the current situation of environmental judicial expertise in the province of Esmeraldas, taking into consideration procedures, actors involved and results in environmental practices, using standardized measures for each of these dimensions, allowing a complete and detailed evaluation of the different aspects of environmental judicial expertise.

The majority of respondents 45.2% have less than 1 year of experience in the field of environmental expertise, followed by those with more than 6 years of experience 22.58%. This indicates a polarized distribution of experience among participants, with a significant concentration of individuals relatively new to the field.

Nearly half of the respondents 45.2% possess a master's or doctoral level of training in environmental law, while 41.94% indicated no academic training in the field. This suggests that, although a significant percentage of participants have high academic qualifications, there is also a considerable proportion of individuals with no formal training in environmental law.

Some 38.71% of respondents have never participated in legal proceedings related to environmental crimes in the last two years, while 32.26% have participated occasionally (1-2 times a year). This could indicate limitations in the application or opportunity to involve environmental experts in judicial proceedings.

More than half of the respondents 58.06% have received specific training in environmental expertise, suggesting that there is an adequate level of specialized training among professionals, although there is still room to increase this percentage.

These findings allow a better understanding of the current procedures of environmental legal expertise in Esmeraldas, as well as identifying the main actors and the results of their participation. Now, we will move on to the second specific objective, which is to characterize the quality and rigor of the expert opinions. For this purpose, the perceptions on the quality and rigor of these expert opinions are analyzed, which implied examining the answers to questions related to the relevance of academic training and experience in the quality of the expertise, evidencing the following results.

The characterization of the quality and rigor of the expert opinions made in judicial processes for environmental crimes in the province of Esmeraldas, based on the perceptions of the respondents, is detailed below:

For each of the indicators measured in this objective, it was possible to evidence what is presented in Table 4, where it was possible to establish the following analyses. Evaluation of Environmental Cases: The mean of the responses suggests a moderate tendency towards having evaluated more than 20 environmental cases, with a mean of 2.77 and a standard deviation of 1.54 in a scale of 1 to 5.

Academic Training in Environmental Law: The participants perceive that they have received academic training from nationally or internationally recognized institutions, with a mean of 3.23 and a standard deviation of 1.56. This suggests an overall positive assessment of the quality of their academic training.

Preparation to Face Job Challenges: Responses indicate a positive perception that academic training in environmental law has adequately prepared respondents to face challenges in their field of work, with means close to 3 in the relevant questions and variations in the standard deviations.

Combination of Experience and Academic Training: There is a positive perception of the effectiveness of combining environmental expertise experience and academic training in environmental law to address environmental problems in the area of work, with a mean of 3.10 and a standard deviation of 1.74.

These results suggest that, in general, environmental experts in the province of Esmeraldas perceive that their academic training and experience are adequate and effective for their professional performance, although there is variability in perceptions, which could indicate specific areas for improvement in training or in the practice of environmental expertise.

To address the third specific objective, which is to propose guidelines and recommendations to strengthen and improve the effectiveness of judicial expertise in cases of environmental crimes in Ecuador, the findings of the previous analysis are considered. In this order of ideas, the following proposals are presented based on the perceptions and experiences of the respondents in the province of Esmeraldas.

a. Strengthening of Academic Education and Continuing Training

Promote specific master's and doctoral programs in environmental law and expertise, given the importance of this training in professional performance, which could include the creation of specialized chairs, workshops, and seminars with nationally and internationally recognized institutions. In addition to implementing continuous training programs that are aligned with the current and future needs of the environmental sector, focusing on the latest trends, technologies and expertise methodologies.

b. Practical Experience and Case Evaluation

Establish mentoring and internship programs for less experienced experts, taking advantage of the knowledge of professionals with more than 6 years in the field, this can help improve the quality of expert opinions through the exchange of experiences and best practices. As well as promoting the evaluation and discussion of practical cases

as part of education and training, including the analysis of case studies and expert witness simulations, to improve preparation for real challenges.

c. Participation in Judicial Proceedings

Increase the participation of environmental experts in judicial proceedings, especially for those who have participated less frequently, therefore, the proposed could be achieved through the creation of a registry of qualified environmental experts accessible to judicial authorities, promoting their inclusion in more cases.

d. Creation of Collaborative Networks

Encourage the creation of collaborative networks between environmental experts, academic institutions, and justice agencies, to share knowledge, resources, and best practices, this dynamic could include forums, conferences and working groups specialized in environmental crimes.

e. Continuous Evaluation and Feedback

Establish evaluation and feedback mechanisms for environmental experts, allowing for the identification of areas for improvement in both professional practice and academic training, including follow-up surveys, peer reviews, and accreditation systems.

Therefore, the implementation of these recommendations would work towards continuous improvement of the effectiveness of judicial expertise in environmental crime cases in Ecuador, ensuring that experts are well prepared, are actively involved in judicial processes, and are aware of best practices and advances in their field.

The effectiveness of judicial expertise in the environmental field is a fundamental pillar for the effective resolution of environmental crimes, especially in regions of high biodiversity such as the province of Esmeraldas in Ecuador. In this context, two crucial factors that influence the quality and rigor of the expert opinions are the experience of the environmental experts and their level of academic training. These elements not only determine the technical competence and specific knowledge applied during the expertise process, but also how these professionals perceive and value their own practice and its impact on environmental justice.

Therefore, the correlation analysis using the Chi-square test between the questions associated with experience in environmental expertise, the level of academic training, and the average ratings on the Likert scales is justified as a means to explore the existence of significant relationships between these variables. This statistical approach will allow us to identify whether perceptions of expert witness effectiveness and satisfaction with the outcomes of environmental practices vary significantly as a function of expert witness experience and education. By better understanding these relationships, it will be possible to formulate strategies aimed at strengthening expert witness capacity and ultimately improving the quality of environmental justice in the region.

The Pearson correlation table presented reveals significant relationships between three critical variables in the field of environmental expertise, i.e., experience in environmental expertise, level of academic training in environmental law, and average ratings on Likert scales reflecting perceptions of the effectiveness of judicial expertise and satisfaction with the outcomes of environmental practices. The significant correlation ($r = 0.810$, p -value < 0.001) between experience in environmental expertise and level of academic training suggests that these two factors are strongly linked to each other, which could indicate that those professionals with more experience also tend to have a higher level of academic training. This finding underscores the importance of a solid academic background as a foundation for accumulating relevant experience in the field of environmental expertise.

In addition, experience in environmental expertise shows a significant positive correlation ($r = 0.500$, $p = 0.004$) with ratings on Likert scales, indicating that, the more experience, the more positive perceptions of the effectiveness of legal expertise and satisfaction with the results of environmental practices tend to be. Similarly, the level of academic training in environmental law is significantly correlated ($r = 0.567$, $p < 0.001$) with the average ratings on the Likert scales corresponding to the outcome in environmental practices, reinforcing the idea that a robust academic background contributes positively to perceptions of the quality and effectiveness of judicial expertise in environmental matters. These results underscore the interconnection between experience, academic training and professional perceptions, highlighting the relevance of both factors in contributing to effective and satisfactory expert practices in the environmental context.

The results obtained in this research reflect a significant correlation between experience and academic training in environmental expertise and perceptions of its effectiveness, which is consistent with previous studies that emphasize the importance of experience and specialized education in the quality of environmental legal expertise. These findings are consistent with literature that underscores the relevance of solid academic and practical training to effectively address complex environmental challenges (Ponce, 2021; Valdés, 2015). However, they contrast with research that suggests a marked disparity between theoretical training and practical application in the field of environmental law, pointing to an area for improvement in the actual training and experience of expert witnesses (García, 2022).

Similarly, this study highlights the interdependence between theory and practice in the field of environmental expertise, reinforcing the theory that the effectiveness of judicial expertise in environmental crimes depends critically on the quality of the academic training and practical experience of the experts. From a practical perspective, it suggests the need for continuing and specialized training programs, as well as the development of standard practices for the preparation of expert opinions. These findings could be applied to improve environmental law training curricula and expert witness training programs, ensuring that they are well equipped to meet the specific challenges of environmental crime. They could also influence the formulation of public policies to strengthen the environmental legal expertise system in Ecuador.

Thus, the research shows conclusively that both experience and academic training in environmental law play fundamental roles in the perception of the effectiveness of environmental legal expertise. The statistical evidence obtained underlines a positive correlation between these factors and the ratings on the Likert scales, which indicates that higher levels of training and experience are associated with more positive perceptions of the effectiveness of the expertise. This finding not only validates the importance of specialized education and practice in the field of environmental law, but also suggests a path towards improving the expert witness process by investing in the professional development of experts. For this reason, the implementation of recommendations based on these findings could contribute significantly to the improvement of the administration of environmental justice in the province of Esmeraldas and, potentially, throughout Ecuador.

Conclusions

The research has unraveled the complex relationship between judicial expertise and its incidence in the resolution of environmental crimes in the province of Esmeraldas in Ecuador, highlighting the interaction between judicial procedures, competences of the actors involved, and the results obtained in the environmental expert practice. Through this analysis, several scientific and theoretical generalizations have been reached that respond concretely to the proposed research objectives, therefore the following conclusions are presented in consideration of the established objectives.

By studying the integration of academic training and practical experience, it was possible to detect that the effectiveness of environmental legal expertise is significantly influenced by the integration of a solid academic training in environmental law with the practical experience of the experts. This integration not only enriches the quality of the expert opinions, but also strengthens the credibility and confidence in the judicial processes associated with environmental crimes.

For this reason, this effective integration of academic training and practical experience emerges as a critical element in strengthening the processes of environmental judicial expertise, revealing a holistic approach to the resolution of environmental crimes. This synergy not only enhances the accuracy and depth of expert opinions, but also contributes to a more robust environmental justice, aligning theoretical knowledge with the real challenges faced in the field. Thus, recognizing and nurturing this interrelationship implies a commitment to the continuing education and professional development of experts, ensuring that their work is supported by a solid academic foundation and enriched by lessons learned from practice. Such an integrative approach not only benefits the quality of expertise, but also fosters an adaptive environmental justice system, capable of responding effectively to evolving environmental regulations and realities.

Similarly, when analyzing the relevance of current judicial procedures, areas for improvement were found regarding the incorporation and valuation of expert opinions in the context of environmental crimes, where the research highlights the need to

optimize these procedures to ensure greater effectiveness and efficiency in the judicial response to environmental problems.

In this sense, the relevance of judicial procedures in the context of environmental judicial expertise stands out as a fundamental pillar to ensure an effective and efficient administration of justice in cases of environmental crimes. The importance of reviewing and adapting these procedures to incorporate expert opinions in a more comprehensive and systematic way, thus ensuring that decision making is based on a deep and scientifically grounded understanding of environmental matters, is underlined. This adaptation of judicial procedures is crucial to overcome existing barriers in the assessment of expert evidence, allowing for a more informed and fairer judgment that adequately reflects the seriousness and specificities of environmental crimes; furthermore, the effectiveness of this approach depends on creating a constructive dialogue between the legal and scientific fields, facilitating a mutual understanding that enriches the judicial process and promotes more accurate judgments and more appropriate corrective measures for environmental protection.

Finally, the impact on environmental practices showed that there is a direct relationship between the quality of the judicial expertise and the results obtained in environmental protection in Esmeraldas, where two well-founded and rigorous expert opinions are key to establishing clear responsibilities and defining corrective measures that effectively contribute to environmental conservation.

It is for this reason that the impact of expert opinions on environmental practices transcends the judicial sphere, exerting a significant influence on the conservation and management of the environment in the province of Esmeraldas, being of great importance what was revealed in this research, where it is evident how a well-founded judicial expert opinion not only contributes to a more informed decision making within the justice system, but also establishes important precedents for the implementation of environmental policies and sustainability practices.

Therefore, by highlighting the direct relationship between the thoroughness of expert opinions and the effectiveness of the corrective measures applied, it underscores the need to adopt a comprehensive approach that considers environmental expertise as a key mechanism for driving improvements in legislation, regulations, and environmental protection policies. Thus, expert opinions act as catalysts for positive change, promoting greater responsibility and awareness of the impact of human activities on the environment and encouraging the development of more sustainable and nature-friendly strategies.

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