



The Effectiveness Of The Implementation Of Ecuadorian Regulations For Crime Scene Preservation: Impact On The Integrity And Validity Of Forensic Evidence

La Efectividad En La Implementación De La Normativa Ecuatoriana Para La Conservación De La Escena Del Crimen: Impacto En La Integridad Y Validez De La Evidencia Forense

Jefferson David Barragan

Master's Degree in Criminalistics and Forensic Sciences.

National University of Chimborazo. UNACH

<https://orcid.org/0009-0006-0840-4351>

Wendy Pilar Romero Noboa

Lawyer. Master in Law, mention in criminal law and criminal procedure, undergraduate professor at the National University of Chimborazo. UNACH.

<https://orcid.org/0000-0002-8550-2864>

Summary

This research was conducted with the aim of analyzing the effectiveness of the implementation of Ecuadorian regulations for crime scene preservation and their impact on the integrity and validity of the collected forensic evidence. A qualitative design was employed, using an exhaustive literature review of Ecuadorian regulations and international protocols related to the collection and handling of evidence. The study focused on the context of Ecuador, a country with a robust regulatory framework but significant challenges in its practical application.

Received 2025-01-09

Revised 2025-04-03

Published 2025-06-07

Corresponding Author

jefferson.barragan@unach.edu.ec

Pages: 104 -136

<https://creativecommons.org/licenses/by-nc-sa/4.0/>

Distributed under



Copyright: © The Author(s)

The intervention involved analyzing the current regulations, comparing them with international standards, and identifying operational and structural barriers that hinder their effective implementation, as well as comparing findings with research conducted in other countries. The results indicated that the lack of resources, insufficient training of justice operators, and the involvement of unauthorized individuals at crime scenes compromise the proper preservation of evidence, affecting the reliability of investigations.

Therefore, the research demonstrated that, despite having a solid legal framework, the effectiveness of the regulations depends on rigorous implementation and overcoming operational obstacles such as resource limitations and the need for specialized training in rural areas to ensure the validity of evidence in judicial processes.

Keywords: Right To A Fair Trial, Forensic Evidence, Chain Of Custody, Crime Scene, Investigation.

Resumen

La investigación se desarrolló bajo el enfoque de analizar la efectividad de la implementación de la normativa ecuatoriana para la conservación de la escena del crimen y su impacto en la integridad y validez de la evidencia forense recolectada. Para ello, se empleó un diseño cualitativo, utilizando una revisión bibliográfica exhaustiva de la normativa ecuatoriana y los protocolos internacionales relacionados con la recolección y manejo de evidencias. El estudio se centró en el contexto de Ecuador, un país con una estructura normativa robusta, pero con importantes desafíos en su aplicación práctica. La intervención en este caso fue el análisis de la normativa vigente, comparada con estándares internacionales, y la identificación de las barreras operativas y estructurales que dificultan su implementación efectiva, así como una comparación con

investigaciones realizadas en otros países. Los resultados indicaron que la falta de recursos, la insuficiencia en la capacitación de los operadores de justicia y la intervención de personas no autorizadas en la escena del crimen comprometen la preservación adecuada de las pruebas, afectando la confiabilidad de las investigaciones. Por ello, la investigación demostró que a pesar de contar con un marco legal sólido, la efectividad de la normativa depende de una implementación rigurosa y de la superación de obstáculos operativos, como la falta de recursos y la capacitación especializada en las zonas rurales, para asegurar la validez de las evidencias en los procesos judiciales.

Palabras clave: Derecho A Un Proceso Justo, Evidencia Forense, Cadena De Custodia, Escena Del Crimen, Investigación.

Introduction

The location of the criminal incident, commonly referred to as the crime scene or site of the unlawful act, constitutes that specific area of space where the illegal activity took place and is inherently prone to the disclosure of objectively verifiable remains or traces that can provide critical information, thus serving as the primary source of evidence that can be immediately sought, which is essential to elucidate the circumstances surrounding the event in question (Eldridge, 2023). On-site investigation is an irreplaceable activity that must be conducted promptly to capture the original state of the crime scene. Delays or incomplete investigations can lead to poor results and compromise the quality of the judicial process (Anane, 2024).

The crime scene, also known as the scene of the crime, is the specific site where the unlawful conduct took place, a space in which a series of indicators and signs can be found that facilitate the positioning of

the investigation, all with the objective of achieving a comprehensive understanding of the actual events that took place and establishing the factual basis of the unlawful acts committed in that space.

Forensic specialists employ scientifically based techniques for evidence collection, ensuring systematic sampling to maintain integrity and minimize contamination. Each item collected must follow robust chain-of-evidence procedures, documenting its movement from the crime scene to the laboratory and ultimately to the courtroom (Heavey, 2023). This unbroken chain of custody is critical to validate the authenticity of evidence and thus ensure its admissibility in court proceedings. Compliance with these protocols maximizes the possibility of recovering forensic trace material and maintaining the integrity of the investigation.

Therefore, meticulous attention to detail and rigorous adherence to proper forensic procedures at the crime scene are critical to ensure that the evidence collected is reliable and valid, which ultimately plays a critical role in the pursuit of justice and the resolution of the case at hand.

To this end, it is essential to identify the classification of crime scenes. In the first instance there are open or outdoor scenes, understood as areas where criminal activity has occurred and are now the subject of extensive examination, but the inherent challenge of these scenes lies in their expansive nature, often encompassing vast public spaces, such as streets and outdoor environments, which undergo continuous alterations, influenced by a multitude of factors, including unpredictable natural phenomena and the unpredictable presence of wildlife, which have the potential to compromise the integrity of crucial evidence and significantly alter the physical state of the finds being collected (Jimenez, 2009; Munoz, 2014). The diverse open environments in which criminal acts can occur encompass a wide range of locations, including, but not limited to, busy avenues, remote highways, wide pampas, steep ravines, dense

forests and regions located in mountainous terrain, coastal areas and deep jungles, all of which, by their very nature, lack the necessary protective measures and are susceptible to a range of changing climatic conditions that can fluctuate and affect the investigation.

Second, you have the scene in an enclosed space which is identified as the type of scene that presents the least difficulty for investigators to manage, mainly due to the fact that the process of isolating and preserving evidence is significantly easier in these environments, which are usually enclosed, as investigators can simply secure the area by ensuring that all doors are locked, thus avoiding interference by unauthorized persons. with the integrity of the scene (Jimenez, 2009).

The preservation of crime scenes is to ensure the essential principles that guide the collection, management and examination of the forensic evidence involved in each case, for this, we can take as a basis the principle of exchange of Edmond Locard, which indicates that every contact leaves a trace, however minimal it may be, as a result of the interaction between a person and his environment causes a transfer of materials. Thus, in the context of a crime scene, this idea emphasizes the critical nature of protecting even the smallest elements, such as hair fibers, fingerprints, biological remains or microscopic substances. Any alteration or manipulation of these traces can result in the confiscation of vital evidence, which would cause a danger in the reconstruction of the facts and the identification of possible perpetrators (Jindal, 2024).

The preservation of evidence is important as it directly affects the reliability of the analysis and the effective development of legal processes, therefore, forensic laboratories involved in the procedures employ strict compliance protocols in order to ensure that the evidence collected is processed without contamination or loss of its characteristics (Recipon et al., 2024).

A key and essential principle that complements the process of crime scene preservation is the chain of custody that ensures that the evidence taken is carefully recorded, cared for and controlled from the instant of sample collection until it is presented in court as evidence. This procedure is crucial to preserve the integrity and legal validity of the evidence, as any interruption of the chain could weaken the credibility of the evidence and the development of the legal case (Zavotpayev et al., 2023).

Forensic investigations also present operational challenges, understood as the theory of forensic error, which may include human, technical or organizational factors (Vernaza, 2024). In Ecuador, specific challenges, such as lack of resources, insufficient training and procedural inconsistencies, contribute significantly to forensic errors. These problems require a comprehensive approach to identify and mitigate errors to ensure reliable forensic results (Jindal, 2024).

Theories based on environmental criminology focus on understanding crime through analysis of the environment in which it occurred, emphasizing the importance of documenting and analyzing crime scenes to develop effective prevention strategies. These theories emphasize the role of situational and environmental factors in influencing criminal behavior. This approach is multidisciplinary and incorporates knowledge from sociology, psychology, and law enforcement to address crime in a comprehensive manner (Ceccato, 2024).

Legal framework in Ecuador

For the preservation of crime scenes, Ecuadorian regulations are based on a set of legal norms and international principles that guide forensic practice. This body of norms establishes the responsibilities of justice participants and defines the minimum standards to ensure that investigations are carried out in a transparent and efficient manner. The following is the applicable legal basis for the context presented:

Constitution of the Republic of Ecuador: the right to due process is stipulated in Article 76 (due process guarantees) of the Ecuadorian Constitution. It establishes a fundamental provision for the integrity of the investigations, protection of the parties involved, security that the evidence is obtained, handled and presented as determined by law. Furthermore, paragraph 4 of the aforementioned article establishes that any evidence obtained illegally lacks legal validity, underlining the need for rigorous and transparent procedures (Constitution of the Republic of Ecuador, 2008).

The principle of legality is crucial in criminal law, as it ensures that actions are based on established legal norms and prevents the retroactive application of unfavorable laws (Bledar & Ganaj, 2019).

In Ecuador, this principle is part of a broader constitutional framework that emphasizes the rule of law and justice, ensuring that legal actions, including crime scene preservation, are carried out within a legal framework (Rodas & Largo, 2017).

Integral Organic Penal Code: the preservation of the crime scene is mainly regulated by the Integral Organic Penal Code (COIP), since this body of law in its articles 456, 460 and 461 establishes certain guidelines for the collection, handling and preservation of evidence at a crime scene. In particular, article 460 provides that the prosecutor, in coordination with the specialized investigation personnel assigned to each case, protects the crime scene, ensuring that no unauthorized persons enter the place. If necessary, the prosecutor will use the security forces to preserve the site for up to eight hours, guaranteeing in some way that the existing evidence will not be tampered with. This mandate underlines the importance of an immediate and controlled intervention to avoid alterations that compromise the investigative process (Código Orgánico Integral Penal [COIP], 2014).

In addition, Article 292 penalizes the alteration of evidence and elements of proof, imposing sanctions on those who compromise

their validity, because they alter the scene and the results that can be obtained (COIP, 2014).

Resolution No. 073 FGE 2014: published in the Official Gazette Supplement No. 318, establishes protocols for the handling of evidence within the chain of custody system. Although this instrument details specific procedures for the protection of evidence from its collection to its presentation at trial, it does not comprehensively address previous stages, such as cordoning off and initial delimitation of the crime scene (Fiscalía General del Estado, 2014).

Organic Code of the Judiciary: this law complements the criminal legal framework by regulating the responsibilities of judicial operators. It underlines the obligation of judges, prosecutors and experts to act with diligence and professionalism in the handling of evidence. It also establishes mechanisms to supervise and evaluate the performance of officials in order to prevent irregularities (Comisión Legislativa y de Fiscalización, 2009).

Applicable International Standards: Ecuador, as a signatory to several international treaties, is also governed by principles and guidelines established in global forums. Among the most relevant regulations are:

The United Nations Crime Scene Manual is the instrument that provides guidelines on how to preserve and process crime scenes.

The protocols established by INTERPOL set international standards for the collection and handling of forensic evidence at crime scenes.

The guidelines associated with the American Convention on Human Rights protect the procedural rights of persons involved in criminal investigations (Kolomiiets et al., 2023).

These international standards serve as a reference for evaluating Ecuadorian practices, allowing gaps and areas for improvement to be identified.

Complementary Regulations: Complementary regulations, such as internal procedures established by the Judicial Council and protocols issued by police and forensic institutions, play an indispensable role in specifying the methodologies to be followed for intervention in investigations. These regulations ensure that procedures are carried out systematically and effectively, addressing the complexities of various criminal cases. In addition, they provide a process for investigators to follow, which improves coordination and efficiency in the investigation, which is why, internal procedures and protocols are essential to guide investigators through the complexities of criminal investigations, such as the cases of premeditated murder and domestic violence (Komarynska & Polia, 2023; Rozi et al., 2023).

Main challenges and barriers in the application of the regulations

The effective implementation of any regulation is conditioned by structural, operational and human factors. In the case of crime scene preservation in Ecuador, the main challenges can be theorized from the following perspectives:

Institutional deficit theory

Institutional deficit theory highlights how structural deficiencies within systems hinder their ability to meet regulatory objectives. In Ecuador, these deficiencies manifest themselves as shortages of logistical resources and geographic inequality, which particularly affect rural areas. These problems are emblematic of broader institutional failures that can be observed in various contexts, such as:

Lack of logistical resources: many areas of Ecuador lack essential investigative equipment such as forensic kits, cameras and specialized vehicles, which are crucial for effective law enforcement

and regulatory compliance. This scarcity of resources is a common theme in institutional failures, where inadequate infrastructure and tools prevent institutions from effectively fulfilling their mandates (Bitencourt & Silvestre, 2023).

Geographic inequality: Rural areas of Ecuador often have less access to the necessary forensic infrastructure compared to urban regions, which exacerbates the challenges of implementing effective regulatory measures. This geographic disparity is a common problem in Latin American countries, where institutional weaknesses are often the result of political strategies that affect the implementation of laws and regulations (Bitencourt & Silvestre, 2023).

Training gap theory

The training gap theory highlights the critical role of training and competencies in the effective implementation of regulations, particularly in Ecuador's judicial system. Inadequate training of justice operators, police and forensic experts poses significant challenges, such as lack of documentation, non-compliance with protocols and an increased risk of evidence contamination. This problem is compounded by the lack of continuous and specialized training programs, leaving operators ill-prepared to deal with daily challenges (Smith & Horne, 2024).

This translates into:

- Failures in documentation and evidence collection.
- Non-compliance with established protocols.
- Increased likelihood of contamination or loss of evidence.

The absence of continuous and specialized training programs exacerbates this problem, leaving operators without up-to-date tools to meet the challenges of daily practice (Ødegård & Willumsen, 2021).

Forensic error theory

Forensic error theory highlights the susceptibility of crime scene management to human and technical errors, which can compromise the admissibility of evidence. Factors such as lack of time, inadequate supervision and lack of clear protocols contribute significantly to these errors. In Ecuador, preliminary studies have shown that many court cases are compromised due to failures in the chain of custody and inadequate scene management. This problem is not unique to Ecuador and reflects broader systemic challenges in forensic science, therefore:

Human and technical errors in forensic science: Errors in forensic science are often due to human factors, such as cognitive biases and subjective interpretations, especially in pattern recognition disciplines such as handwriting analysis (Crown et al., 2024). Technical errors may be due to inadequate scientific basis, lack of resources, and organizational deficiencies in training and management (Morgan, 2023).

Mitigation strategies: error mitigation includes implementing quality management practices, using checklists to avoid errors of omission, and conducting independent, blind peer reviews (Crown et al., 2024).

Contextual factors

The analysis of regulatory enforcement challenges must consider various socio-cultural and economic factors, such as corruption, media influence and political instability. These factors have a significant impact on the effectiveness and impartiality of regulatory systems. Corruption and conflicts of interest undermine confidence in judicial systems, while social and media pressures can skew priorities toward speed rather than accuracy. Political instability disrupts continuity in policy implementation, affecting regulatory effectiveness (Lisdiyono & Suatmiati, 2017).

Corruption and conflicts of interest: these problems erode confidence in the judicial system and affect the impartiality of the investigation.

Media and social pressure: sensationalist media coverage can influence the performance of operators, prioritizing speed over accuracy.

Political instability: frequent changes in command and political structures affect the continuity and effectiveness of interventions (Enggarsasi & Sa'diyah, 2023).

Organizational resilience theory

Despite existing barriers, organizational resilience posits that systems can be adapted and strengthened through well-designed strategies. To do so, they must:

- Implement periodic audits to monitor adherence to protocols.
- Promote a culture of continuous improvement among justice operators.
- Develop partnerships with international institutions for knowledge and resource sharing (Shvindina et al., 2024).

Analysis of the research problem

The crime scene represents the indispensable environment in the investigation, since it is where crucial evidence is collected for the correct application of Ecuadorian law, which is why the importance of preserving the crime scene lies in its direct impact on the integrity and validity of the forensic evidence.

Being the initial epicenter of any investigation, the crime scene requires proper preservation, since the validity of the evidence collected for the administration of justice depends on this action. That is why the COIP, in accordance with other regulatory bodies,

points to the chain of custody as a tool to guarantee the authenticity of the evidence. However, there are deficiencies in the practical implementation of these regulations, aggravated by the lack of specific manuals for the preservation of crime scenes, generating serious difficulties for the progress of investigations.

Despite a robust legal framework, practical implementation in Ecuador faces several considerable challenges affecting crime scene preservation. One of the most important problems is the lack of specialized training of the parties involved in the process, as studies show that forensic professionals do not receive training in preservation techniques, which increases the risk of errors or contamination of evidence. In addition, the lack of basic logistical resources, such as evidence collection kits, adequate photographic cameras or specialized vehicles for forensic transport, creates a problem with the possible damage to the crime scene. In addition, supervision and adherence to established protocols are inconsistent. Reports from the Judiciary Council have indicated that, in some cases, procedures are not adequately documented, raising doubts about the validity of the chain of custody. This lack of rigor compromises the reliability of evidence presented in court.

On the other hand, it is also important to take into consideration the sociocultural aspect of crime scene preservation, which influences the implementation of current regulations in Ecuador, and cultural factors such as the perception of justice, trust in institutions and local practices significantly affect crime scene management. The latter influences certain rural and indigenous areas of Ecuadorian territory, which have their own customs and community dynamics that can affect the application of the justice system, resulting in social pressure, media coverage and the impact of cultural values.

It is therefore important to examine the impact of proper preservation of the crime scene on the integrity of the evidence collected, especially in crimes against the sanctity of life, such as

homicides, femicides and murders. These offenses require immediate, precise and professional action by the authorities in charge, who must ensure that the handling of the scene respects fundamental principles such as legality, integrity and authenticity of the evidence, therefore, the research focuses on analyzing the effectiveness of the implementation of Ecuadorian regulations for the preservation of the crime scene and its impact on the integrity and validity of the forensic evidence, this in order to ensure the reliability of the facts, for this, the following research question has been pointed out: How does the effectiveness in the implementation of Ecuadorian regulations for crime scene preservation affect the integrity and validity of the collected forensic evidence?

Methodology

The research will be developed with a qualitative approach due to the characteristics of the subject matter. For this purpose, a bibliographic review will be used as the primary source of information. This approach is appropriate for analyzing the effectiveness of Ecuadorian regulations on crime scene preservation, since it allows for an exhaustive exploration of the Ecuadorian legal framework, the challenges in its implementation, and to relate it to international practices, based on relevant literature and official documents.

Type of Research

The research will be descriptive-analytical in nature, as it will focus on describing and analyzing the normative, operational and theoretical aspects related to crime scene preservation. This includes a critical evaluation of Ecuadorian regulations (mainly the Organic Integral Penal Code) and its comparison with recognized international standards.

Sources of Information

The literature review will cover documents such as:

Legal regulations and official documents: Comprehensive Organic Criminal Code (COIP), Constitution of the Republic of Ecuador, institutional protocols, and international treaties ratified by Ecuador.

Scholarly articles, books and publications addressing crime scene preservation, chain of custody, and evidence management in forensic contexts.

Academic databases such as Scopus, PubMed, and Google Scholar Web Offsite to access relevant studies.

Data Collection Techniques

The information to be obtained will be carried out through a systematic search process in academic databases and legal repositories that address the topic in reference, therefore, keywords related to the research topic will be used, such as: "crime scene", "Ecuadorian regulations", "chain of custody" and "forensic evidence management", "scene preservation", among others.

To guarantee the validity of the information, priority will be given to updated documents (preferably from the last 10 years), relevant to the Ecuadorian context and from reliable sources.

Results

Crime Scene Description

In any investigation, the crime scene becomes the starting point for the collection of evidence necessary to reconstruct the illicit acts. In Ecuador, crime scenes are classified depending on their main characteristic:

Open scene: it becomes the space that is outdoors, which is why it presents its own challenges due to its exposure to environmental factors, climatic changes, interference of urban fauna, access by unauthorized persons; elements that increase the probability of alteration of the evidence.

Closed scenes: these are limited physical locations; in these spaces investigators have a higher level of control to maintain the evidence required in illicit acts, thus reducing the risk of contamination.

Therefore, for the collection of data at the crime scene, Edmond Locard's principle of exchange is taken into consideration, which refers to the importance of preserving all traces, even the smallest and most insignificant, since any contact can leave clear evidence for the investigation.

Edmond Locard's Exchange Principle: Scientific Basis and Application

Edmond Locard's principle of exchange, which postulates that "every contact leaves a trace," is fundamental to forensic science. This principle has significantly influenced forensic methodologies by providing a scientific basis for evidence collection and analysis. The application of the principle is evident in various forensic fields, from digital forensics to biological trace analysis, underscoring its versatility and importance in modern criminal investigations (Bergmann et al., 2024).

Locard's principle is based on the premise of the interaction that a person can have with his environment, which includes objects and other individuals, since it generates a transfer of materials, which can be recognized with the naked eye, or sometimes with the support of the microscope, therefore, they are differentiated:

Visible physical evidence: can be recognized in fingerprints, textiles, hair, residues such as blood or saliva, among others.

Non-visible physical evidence: microscopic particles such as dust, paint chips, broken glass, gunshot residue and chemical components.

This principle is supported by materials science, molecular biology and analytical chemistry, which allow the identification and analysis of transferred traces. Technological advances, such as electron microscopes and DNA testing, have increased the ability to detect even the most subtle transfers (Wahab, 2024).

The Locard principle supports the importance of carefully and meticulously preserving the crime scene, since it is the basis for reconstructing the events that occurred, allowing the identification of remains that are linked to the scene. In the same way, it is possible to identify the participants, differentiating between the victim and the suspect in order to establish links and participation in the investigation.

Although the principle generates relevance for the collection of evidence at crime scenes, its implementation still presents several challenges for its correct application in Ecuador:

Insufficient training: Investigators designated for the discovery of findings may be poorly trained to identify, collect and handle small or microscopic evidence.

Lack of resources: the lack of advanced technological equipment limits the capacity to detect minimal transfers.

Unauthorized interventions: access by unauthorized persons to the crime scene may alter or destroy key evidence for the development of the investigation.

By virtue of the advantages, the application of the Locard principle has a direct impact on the application of justice for the resolution of cases, including:

Facilitates the identification of those responsible: significantly improves the ability to identify the persons or entities responsible for a particular situation or event: this is achieved by meticulously tracing different materials to their singular origin, thus establishing a clear connection between the materials and those responsible for their presence.

Provides solid scientific evidence: the material transfer process can be used to support eyewitness accounts with corroborative evidence or to effectively challenge and refute contradictory statements made by various parties involved in the matter in question.

Mitigates ambiguity in the judicial system: evidence obtained on the basis of this fundamental principle yields objective conclusions that are inherently less prone to personal bias and subjective interpretations, thus providing a more reliable basis for legal proceedings and decision-making in courts of law.

Sample Collection

The systematic collection of forensic samples at crime scenes represents an essential procedure that is meticulously governed by the Comprehensive Organic Criminal Code (COIP) within the jurisdiction of Ecuador, thus establishing the chain of custody as an indispensable mechanism to safeguard the integrity and authenticity of evidence throughout the investigation process.

This comprehensive process requires thorough documentation of the handling of each individual item, beginning with its initial collection, progressing through its analysis in a controlled laboratory environment and culminating with its presentation during court proceedings to ensure that each phase maintains a clear and traceable record.

However, Ecuador faces significant operational challenges that become apparent during this critical stage of the research process:

A significant deficiency in logistical resources: in many regions of the country there is a marked lack of essential equipment, including, but not limited to, forensic kits designed for evidence collection, high-resolution photographic equipment for accurate documentation, and specialized vehicles designed for the safe transport of collected evidence, all of which contribute to a reduced ability to effectively manage crime scenes. These systemic deficiencies have a direct and detrimental impact on the overall quality of crime scene management, thus compromising the integrity of the investigative process.

Lack of adequate training: justice operators, who play a key role in crime scene preservation and evidence collection, are often inadequately trained in the fundamental techniques required to preserve crime scenes and collect evidence effectively, which significantly increases the risk of procedural errors and contamination of critical evidence.

The establishment and implementation of clear and standardized procedures, along with the provision of adequate resources, are essential prerequisites for improving the overall effectiveness of evidence preservation in the criminal justice system.

Comparison with Procedures in Latin America

Compared to other Latin American countries, Ecuador has a robust regulatory framework, but its practical implementation faces limitations that affect crime scene preservation.

Table 1: Comparative table of procedures in Latin America

Country	Crime Scene Preservation Strengths	Challenges Identified
Ecuador	<ul style="list-style-type: none"> - Robust regulatory framework (COIP and Constitution). 	<ul style="list-style-type: none"> - Lack of specialized training for operators. - Lack of logistical resources in rural areas.
Chile	<ul style="list-style-type: none"> - Implementation of continuous training programs for police and prosecutors. - Use of advanced technology for scene documentation. 	<ul style="list-style-type: none"> - Challenges persist in remote areas due to the extensive geography.
Colombia	<ul style="list-style-type: none"> - National operational manuals adapted to international standards. - Effective coordination between police and prosecutors. 	<ul style="list-style-type: none"> - Influence of the armed conflict on the preservation of certain scenes.
Argentina	<ul style="list-style-type: none"> - Presence of advanced forensic laboratories in large cities. - Incorporation of ISO standards in forensic analysis. 	<ul style="list-style-type: none"> - Significant resource gaps between urban and rural areas.
Mexico	<ul style="list-style-type: none"> - Protocols for the protection of evidence in high impact crimes. - Implementation of digital systems for chain of custody management. 	<ul style="list-style-type: none"> - High level of corruption that affects process reliability.
Peru	<ul style="list-style-type: none"> - Progress in the formation of specialized criminal investigation units. - Focus on compliance with international chain of custody standards. 	<ul style="list-style-type: none"> - Limited coverage of trained personnel in remote regions.

Comparative Analysis

From the findings obtained from the various scientific articles, it can be seen that there are several similarities and differences in relation to the importance of crime scene preservation, as detailed below:

Similarities: Several countries worldwide have established particular regulatory frameworks that are designed to regulate and maintain the integrity of crime scene preservation, with many of these regulations being laws that are aligned with widely recognized international standards that facilitate cooperation among nations. In addition, the principles of maintaining a secure chain of custody of evidence, as well as the incorporation of advanced technological tools, are the predominant characteristics observed in practices adopted throughout the region.

Differences: when comparing the regulations established for Ecuador, compared to countries such as Chile and Mexico, which have a remarkable technological advancement, as they have implemented cutting-edge equipment accompanied by digital methodologies, thus achieving greater reliability of the processes of evidence collection and management. In addition, the geographic disparities present in Argentina and Ecuador pose similar obstacles to effective law enforcement and judicial processes, while Colombia faces a different set of problems that are closely related to the widespread consequences stemming from the prolonged armed conflict and violence.

Key Challenges in Ecuador

The research results highlight a number of barriers that limit the effectiveness of crime scene preservation in the Ecuadorian context:

Geographic inequality: rural areas lack access to basic forensic resources, which generates significant inequality in the development of investigations and in comparison with urban areas.

Sociocultural pressure: in certain communities, especially in rural areas, traditional practices and perceptions of justice influence the ability of investigators to apply established protocols and procedures.

Procedural inconsistencies: the main problem is poorly documented procedures, generating doubts as to the validity of the evidence presented in each procedure.

These challenges underscore the need for specific policy reforms in training, resource allocation and procedural oversight.

Technical basics of crime scene preservation

The analysis reveals that proper crime scene preservation in Ecuador is based on international principles, such as the chain of custody and the Locard exchange principle. However, implementation faces barriers that limit the effectiveness of these regulations:

Operational barriers: Among the many challenges facing organizations, particularly when considering the imperative of operational efficiency, there is a pronounced and substantial deficit in the availability of specialized training programs that are meticulously tailored to meet the distinctive and specific needs of the workforce; in addition to this, there is a glaring insufficiency of adequate resources and robust infrastructure that are essential to effectively support and facilitate these crucial initiatives. These pervasive problems are widely recognized throughout Latin America, but manifest themselves in an even more acute, pronounced and alarming manner in the particular context of Ecuador.

Socio-cultural factors: the complex and multifaceted nature of the perception of justice, when combined with entrenched community practices that are deeply rooted and prevalent in certain regions, contributes to further complicate, obstruct and hinder consistent adherence to and compliance with established protocols and norms that are generally anticipated and expected in such settings.

Comparison with the Regulatory Framework in Ecuador

The effective implementation of Ecuadorian regulations for crime scene preservation is a fundamental pillar in the administration of

justice, as it guarantees the integrity and validity of forensic evidence used in criminal proceedings. The Código Orgánico Integral Penal establishes a detailed normative framework that regulates the procedures for preservation and collection of evidence, with the objective of avoiding contamination or improper manipulation of evidence.

On the one hand, Article 456 is key in this context, since it imposes the mandatory nature of the chain of custody, ensuring that each piece of evidence from the crime scene is handled only by authorized personnel and following strict documentation protocols to avoid any type of contamination. However, in practice, the lack of training and resources may compromise its proper application, affecting the admissibility of evidence at trial. In addition, Article 460 provides that the prosecutor, working together with forensic experts, should conduct a reconnaissance of the scene of the crime, restricting access to the crime scene for up to eight hours and ensuring that the evidence is properly secured. Despite this provision, in Ecuadorian reality there are cases where the late intervention of prosecutors or the contamination of the area by unauthorized persons affects the quality of the evidence, altering the investigations and even affecting the intervening parties. Along the same lines, article 461 emphasizes the importance of the ocular technical inspection, a procedure that allows the identification of fingerprints, traces and other elements relevant to the investigation. However, its success depends on the rigorous application of established protocols, which may be limited by deficiencies in logistics or lack of specialized equipment.

On the other hand, article 463 regulates the collection of biological samples, establishing principles of confidentiality and protection of fundamental rights, which avoids the revictimization of the persons involved in the process. In terms of recovery and analysis of objects related to the crime, article 467 requires formal documentation and allows their temporary safekeeping until their presentation at trial,

guaranteeing their availability as evidence. Finally, article 468 empowers the prosecutor to carry out the reconstruction of the event, a fundamental tool to verify investigative hypotheses through the participation of witnesses and victims at the scene of the events.

Despite the clarity of these provisions, their effectiveness depends on strict compliance by justice operators, the availability of resources and the training of personnel in charge of evidence collection and analysis. Proper implementation of these regulations is essential to ensure the reliability of evidentiary material and prevent miscarriages of justice resulting from deficient or inadequately preserved evidence.

Comparative Table of Investigations

A comparative table with relevant studies is presented below:

Table 2: Comparative analysis of relevant studies

Research	Findings	Regulatory analysis
Using forensic science in the analysis of homicidal crimes (Teotia et al., 2024).	<p>The research analyzes the role and limitations of forensic science in the Indian criminal justice system, highlighting the need for standardized procedural protocols to ensure the reliability and admissibility of evidence.</p> <p>Deficiencies are identified such as inadequate collection techniques, delays in analysis and insufficient sample sizes, factors that can compromise the validity of evidence and lead to erroneous acquittals. In addition, the importance of forensic science in homicide investigation is highlighted, facilitating the identification of victims and</p>	<p>The Integral Organic Criminal Code regulates the collection and handling of evidence at crime scenes. Article 460 of the Code establishes that the prosecutor, working together with forensic experts, must guarantee the preservation of the scene for up to eight hours, avoiding the alteration of evidence. In addition, article 456 imposes the obligation of the chain of custody, ensuring that the evidence is properly documented and handled only by authorized personnel. However, as in India, delays in analysis and lack of specialized training can compromise the validity of evidence and its admissibility at trial. To improve this, there is a need to strengthen collection</p>

The Effectiveness Of The Implementation Of Ecuadorian Regulations For Crime Scene
Preservation: Impact On The Integrity And Validity Of Forensic Evidence

	suspects through the analysis of clothing, biological samples and DNA, which contributes to expediting both investigations and judicial proceedings.	protocols and ensure the availability of well-equipped forensic laboratories.
INVESTIGAÇÃO FORENSE: MÉTODOS E FERRAMENTAS UTILIZADAS PARA RESOLVER CRIMES (Barcelos et al., 2024)	<p>The document stresses the importance of properly isolating and preserving the crime scene to ensure the integrity of evidence and its admissibility in court, noting that the effective implementation of scientific regulations and methods in evidence collection strengthens the criminal justice process and the search for truth in investigations.</p> <p>It also highlights the impact of technological advances, such as DNA analysis and the examination of electronic devices, on the resolution of complex cases, making it possible to optimize forensic investigations and contribute to a safer society.</p>	The COIP establishes measures similar to those in Brazil for the preservation of crime scenes. Article 463 regulates the collection of biological and genetic samples, ensuring procedures that protect the rights of those involved and avoid revictimization. However, Ecuador faces difficulties in the application of advanced technology in criminal investigation, as many laboratories lack state-of-the-art equipment for DNA analysis and digital forensics.
Operational Procedures of Forensic Science Laboratories and Protocols for Sample Collection (Jindal, 2024)	<p>The author analyzes the procedures and operational protocols for sample collection in forensic science laboratories worldwide, highlighting the importance of standardized practices, quality assurance and documentation to preserve the reliability of evidence.</p> <p>Furthermore, he emphasizes that compliance with these protocols prevents contamination, ensures the accuracy of analyses and strengthens the evidentiary validity</p>	Articles 460 and 461 of the COIP establishes the technical ocular inspection as an essential procedure for the collection of evidence at crime scenes. However, in Ecuador there are still deficiencies in the rigorous application of standardized protocols due to lack of training and supervision. Although the regulations require that the procedures be documented and supervised, the reality shows inconsistencies in their application, which jeopardizes the evidentiary

The Effectiveness Of The Implementation Of Ecuadorian Regulations For Crime Scene
Preservation: Impact On The Integrity And Validity Of Forensic Evidence

	of legal proceedings, and underscores the relevance of ethical considerations and compliance with legal frameworks in forensic science, as maintaining high standards of integrity and respect for individual rights contributes to public confidence and reinforces the credibility of the criminal justice system.	validity of the evidence at trial.
Validation of forensic images for assurance of digital evidence integrity (Mccutcheon, 2014).	<p>The study discusses the reliability of digital evidence, the manipulation of forensic container formats, and the need for robust processes in digital forensics to ensure the integrity of evidence in court proceedings. It highlights that any weaknesses in the validation of digital evidence could compromise justice by allowing the admission of tainted or fraudulent evidence.</p> <p>In order to mitigate risks, it focuses on the importance of rigorous validation methods, including independent verification of metadata by an impartial third party, which strengthens the reliability of digital evidence and avoids disputes about its authenticity, thus ensuring the transparency and credibility of the judicial process.</p>	Although digital evidence plays a fundamental role today, Ecuador still lacks a specific regulation that establishes detailed processes for its validation and analysis. The COIP contemplates the principle of chain of custody in Article 456, applicable also to digital evidence, but does not establish specific guidelines on the collection and authentication of this information. This represents a legal vacuum that could generate problems in the admission of digital evidence in criminal trials. The incorporation of international standards and the use of digital forensic audits could improve the reliability and transparency of technological evidence in Ecuador.
Biological Evidence Management at the Crime Scene: An Overview (Kumar et al., 2023).	The results highlight the importance of proper collection, preservation and storage of biological evidence to ensure the integrity and validity of forensic analyses, especially in DNA profiling in criminal investigations. Improper handling can lead to contamination and degradation of samples,	The handling of biological evidence in Ecuador is regulated by article 463 of the COIP, which establishes protocols for obtaining biological samples respecting fundamental rights. Likewise, article 467 regulates the recognition of objects related to the crime, ensuring that they are documented and

	<p>compromising their evidentiary utility and affecting the development of cases.</p> <p>It is therefore essential that forensic investigators receive training in the meticulous handling of evidence, ensuring its reliability and maximizing the impact of DNA technology in the administration of justice.</p>	<p>preserved for use in court. However, as in other countries, Ecuador faces challenges in the collection and proper storage of biological samples, largely due to the lack of storage equipment and reagents in forensic laboratories.</p>
--	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Answer to the Research Question

The effectiveness of the implementation of Ecuadorian regulations directly affects the integrity and validity of the forensic evidence collected. Deficiencies in training, lack of resources and structural problems limit the ability of operators to preserve the crime scene according to established standards. This can result in the contamination or loss of key evidence, weakening court cases and affecting the administration of justice.

Conclusions

The current regulations applicable in Ecuadorian territory related to the preservation of crime scenes are mainly established in the Comprehensive Organic Criminal Code (COIP), as well as in the Constitution of the Republic of Ecuador, which is the Constitution. Both bodies of law clearly stipulate the procedures to be followed for the collection and handling of evidence, ensuring the chain of custody, the preservation of the crime scene and the use of public force in situations that require safeguarding the scene of the event. Despite this, the implementation of these regulations still faces significant obstacles, such as the lack of resources and specialized training in rural areas of the country, which hinders the proper

preservation of crime scenes and thus affects the integrity of forensic evidence.

The main challenge in the application of Ecuadorian regulations governing crime scene preservation is the lack of adequate logistical resources, with forensic kits, specialized vehicles and high-resolution cameras being essential for the collection of samples. These elements are aggravated in certain areas due to geographic inequality, where rural areas lack access to infrastructure and trained personnel, which is why the lack of specialized training of justice operators and forensic experts is a key barrier that contributes to the alteration of evidence and contamination of the scene. Another difficulty is the inconsistencies in the documentation of procedures, which generates doubts about the validity of evidence and compromises the transparency of the investigative process.

Despite the whole scenario, the effectiveness of procedures and protocols for crime scene preservation is still a subject of analysis in Ecuador, because, although there is a robust regulatory framework that recognizes the importance of the chain of custody and the meticulous preservation of evidence, the implementation of these protocols is affected by the lack of adequate supervision and the inability of justice operators to apply the protocols rigorously. This is due to lack of resources, insufficient training and the intervention of unauthorized persons at the scenes. As a result, the effectiveness of procedures is compromised, which negatively impacts the quality and validity of evidence presented in court.

Reference

Anane, I. (2024). Objectives and importance of on-site research. *Technium Social Sciences Journal*, 54, 204-215.

- <https://techniumscience.com/index.php/socialsciences/article/view/10622/4125>
- National Assembly of Ecuador (2014). *Código Orgánico Integral Penal*. https://www.defensa.gob.ec/wp-content/uploads/downloads/2021/03/COIP_act_feb-2021.pdf
- Barcelos, C. D., Cardozo, E. L., Reyes, G. P., Fernandes, G. P., Mezzomo, J. C., Czerwinski, L., Costa, L. B. da, Andriollo, M. A., Reis, M. da S., Santos, R. O. da R., Flôres, T. C., & Silva, V. da. (2024). INVESTIGAÇÃO FORENSE: MÉTODOS E FERRAMENTAS UTILIZADAS PARA RESOLVER CRIMES. *Revista Ft*, 57-58. <https://doi.org/10.69849/revistaft/fa10202410041157>
- Bergmann, T., Bodach, R., Pistorius, L., Preuß, S., Seidel, P., & Labudde, D. (2024). *Colors in Forensics: The Analysis and Visualization of Forensic Data and Evidence*. <https://doi.org/https://doi.org/10.5772/intechopen.1006108>
- Bitencourt, F., & Silvestre, A. (2023). Compreendendo a Fragilidade Institucional. *REI - REVISTA ESTUDOS INSTITUCIONAIS*, 9(1), 95-109. <https://doi.org/10.21783/rei.v9i1.754>
- Bledar, S., & Ganaj, F. (2019). Analysis of the Substantive and Procedural Elements of the Principle of Legality. *European Scientific Journal ESJ*, 15(5). <https://doi.org/10.19044/esj.2019.v15n5p254>
- Ceccato, V. (2024). Introduction to the special issue: Implementing environmental criminology for crime prevention. *Crime Prevention and Community Safety*, 26(2), 133-138. <https://doi.org/10.1057/s41300-024-00203-w>
- Legislative and Oversight Commission (2009). *Código Orgánico de la Función Judicial*. <https://www.funcionjudicial.gob.ec/resources/pdf/normativa/codigoorganicoFJ.pdf>
- Constitution of the Republic of Ecuador (2008). Legislative Decree. In *Registro Oficial* (Vol. 449, Issue 20). <https://www.defensa.gob.ec/wp->
-

- content/uploads/downloads/2021/02/Constitucion-de-la-Republica-del-Ecuador_act_ene-2021.pdf
- Crown, N., Marquis, R., Kupferschmid, E., Dziedzic, T., Belic, D., & Kerzan, D. (2024). Error mitigation in forensic handwriting examination: the examiner's perspective. *Published by OUP on Behalf of the Academy of Forensic Science*. <https://doi.org/10.1093/fsr/owae065/7817821>
- Eldridge, H. (2023). Crime Scene Reconstruction and Event Analysis. In *Encyclopedia of Forensic Sciences, Third Edition* (pp. 696-700). Elsevier. <https://doi.org/10.1016/B978-0-12-823677-2.00132-X>
- Enggarsasi, U., & Sa'diyah, N. (2023). Regulating preventive measures in addressing socioeconomic determinants of crime: Sociolegal and economic considerations. *Journal of Governance and Regulation*, 12(2), 36-42. <https://doi.org/10.22495/jgrv12i2art4>. <https://doi.org/10.22495/jgrv12i2art4>
- Office of the Attorney General of the State (2014). *Manuals, Protocols, Instructions and Forms of the Comprehensive Specialized System of Investigation Forensic Medicine and Forensic Sciences*. <https://www.cienciasforenses.gob.ec/wp-content/uploads/downloads/2017/10/registro-oficial-318-MANUALES-PROTOCOLOS.pdf>
- Heavey, A. (2023). Collection and Chain of Evidence. In *Encyclopedia of Forensic Sciences, Third Edition* (pp. 591-595). Elsevier. <https://doi.org/10.1016/B978-0-12-823677-2.00184-7>
- Jiménez, J. (2009). *The crime scene in criminal profiling*. <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjRvdjlxqCKAxXhQjABHeDdAxIQFnoECBYQAAQ&url=https%3A%2F%2Fdialognet.unirioja.es%2Fdescarga%2Farticulo%2F3064993.pdf&usg=AOvAw01-Ri5lHbOcMzz-WNRvulU&opi=89978449>
- Jindal, Y. (2024). Operational Procedures of Forensic Science Laboratories and Protocols for Sample Collection. *International Journal for Multidisciplinary Research*, 6(3).

- <https://typeset.io/pdf/operational-procedures-of-forensic-science-laboratories-and-4smja8xnvo.pdf>
- Kolomiiets, N., Senchenko, N., Petryk, O., Ivankov, I., Ovsiannikova, O., & Geperidze, D. (2023). International Legal Standards in Crime Prevention. *WSEAS Transactions on Environment and Development*, 19, 110-118. <https://doi.org/10.37394/232015.2023.19.10>.
- Komarynska, Y., & Polia, P. (2023). Criminal offences related to domestic violence: Structure of the investigation methodology. *Law Journal of the National Academy of Internal Affairs*, 13(1). <https://doi.org/10.56215/naia-chasopis/1.2023.28>
- Kumar, N., Gautam, K., Prajapati, P., Paul, S., Gupta, S., Sharma, A., & Verma, D. (2023). Biological Evidence Management at the Crime Scene: An Overview. *Indian Journal of Forensic Medicine and Toxicology*, 17(3). <https://typeset.io/pdf/biological-evidence-management-at-the-crime-scene-an-26xou6fc.pdf>. <https://typeset.io/pdf/biological-evidence-management-at-the-crime-scene-an-26xou6fc.pdf>.
- Lisdiyono, E., & Suatmiati, S. (2017). Socio-Political and Economic Aspects in Legal Context. *European Research Studies Journal*, XX(4B), 149-157. <https://typeset.io/pdf/socio-political-and-economic-aspects-in-legal-context-5doe76r1u3.pdf>
- Mccutcheon, J. M. (2014). *Validation of forensic images for assurance of digital evidence integrity*. <https://typeset.io/pdf/validation-of-forensic-images-for-assurance-of-digital-2zuqpnutn5.pdf>
- Morgan, J. (2023). Wrongful convictions and claims of false or misleading forensic evidence. *Journal of Forensic Sciences*, 68(3), 908-961. <https://doi.org/10.1111/1556-4029.15233>
- Muñoz, M. (2014). *The lack of effectiveness in the chain of custody and its legal implications*. <https://www.dspace.uce.edu.ec/server/api/core/bitstreams/29d56ced-b33e-441c-855e-8e9d746448d6/content>

- Ødegård, A., & Willumsen, E. (2021). Developing a Training Programme for Collaborative Practices Between Criminal Justice and Mental Health Services: The Gap Between Intentions and Reality. In *Improving Interagency Collaboration, Innovation and Learning in Criminal Justice Systems* (pp. 439-460). Springer International Publishing. https://doi.org/10.1007/978-3-030-70661-6_17
- Recipon, M., Agniel, R., Kunemann, P., Ponche, A., Carreiras, F., Hermitte, F., Leroy, J., Hubac, S., Gallet, O., & Kellouche, S. (2024). Detection of invisible biological traces in relation to the physicochemical properties of substrates surfaces in forensic casework. *Scientific Reports*, 14(1). <https://doi.org/10.1038/s41598-024-63911-1>. <https://doi.org/10.1038/s41598-024-63911-1>
- Rodas, X., & Largo, É. (2017). Social, Legal and Political Use of Constitutional Jurisprudence for the Concretization of Rights and the Legitimation of Democracy in Ecuador. *INNOVA Research Journal*, 2(11), 68-95. <https://doi.org/10.33890/innova.v2.n11.2017.307>. <https://doi.org/10.33890/innova.v2.n11.2017.307>
- Rozi, A., Santiago, F., & Barthos, M. (2023). Implementation of Investigations and Investigations in Revealing Criminal Acts of Premeditated Murder. *Jurnal Indonesia Sosial Sains*, 4(06), 563. <http://jiss.publikasiindonesia.id/>
- Shvindina, H., Kuzmenko, O., Kotenko, S., & Kolomiiets, S. (2024). Understanding organizational resilience: A cross-country analysis of factors influencing organizational mortality. *Journal of Eastern European and Central Asian Research (JEECAR)*, 11(5), 850-870. <https://doi.org/10.15549/jeecar.v11i5.1491>
- Smith, J., & Horne, J. (2024). Forensic training- bridging the gap between education and workplace. In *Forensic Science International: Synergy* (Vol. 8). Elsevier B.V. <https://doi.org/10.1016/j.fsisyn.2024.100463>

- Teotia, D., Pokhriyal, S., & Pokhriyal, S. (2024). Using forensic science in the analysis of homicidal crimes. *ShodhKosh: Journal of Visual and Performing Arts*, 5(7). <https://doi.org/10.29121/shodhkosh.v5.i7.2024.1704>
- Vernaza, G. (2024). Judicial expertise and its application to environmental crime in Ecuador. *Espirales Revista Multidisciplinaria de Investigación*, 8(50), 46-64. <https://doi.org/10.31876/er.v8i50.870>
- Wahab, I. (2024). Examining Wrongful Convictions Based on Fingerprint Evidence. *International Journal for Multidisciplinary Research*, 6(5). <https://typeset.io/pdf/examining-wrongful-convictions-based-on-fingerprint-evidence-1xgkoic4xu2d.pdf>
- Zavotpayev, A., Khan, V., & Eremeev, D. (2023). The Crucial Role of Timely Forensic Examinations in Investigating Crimes against the Sexual Integrity of Minors: A Case Study of Kazakhstan's Forensic Analysis System. *Studia Iuridica Lublinensia*, 32(2), 133-148. <https://doi.org/10.17951/sil.2023.32.2.133-148>.