

Analyzing Five-Year Trends of Environmental Crimes in Misamis Occidental: Basis for Crafting Intervention Plans

Rolan Sarino, Cris Ian M. Ong*, Katrina Marie Butalid, Ronilyn Manilhig, Win Marc C. Cabilan & Jose F. Cuevas Jr.

College of Criminology, Misamis University, Ozamiz City, Philippines.
Corresponding Author Email: iancris.ong@gmail.com*

DOI: <https://doi.org/10.46382/MJBAS.2023.7217>



Copyright: © 2023 Rolan Sarino et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Article Received: 23 April 2023

Article Accepted: 14 June 2023

Article Published: 26 June 2023

ABSTRACT

Addressing environmental crimes is an illegal behavior which means that by doing this, it is possible to affect our individual lives. This study explored the environmental crime in the province of Misamis Occidental in the past five years. The descriptive-correlational design was the research design used in the study. The data that was acquired from the DENR office. In order to help the competent authorities create inventive strategies, the trend of environmental crimes in the province of Misamis Occidental during the last five years has been examined. The data shows that environmental crimes have significantly increased over the previous five years, with illegal logging and unlawful disposal of hazardous waste being the most common infractions. The study also demonstrates that the absence of enforcement and regulation contributes to the persistence of these crimes. To address these problems, the authority may think about enacting more severe fines and punishments for the environment to encourage responsible environmental activities, crimes must be reduced, enforcement must be strengthened, and awareness and education initiatives must be launched. These tactics might contribute to decreasing environmental crimes and increasing the province's environmental sustainability. In conclusion, conducting a comprehensive analysis of the five-year trends of environmental crimes in Misamis Occidental is essential and urgent. The insights gained from this study will play a pivotal role in formulating evidence-based intervention plans, empowering the authority to combat environmental crimes effectively and safeguard the province's natural resources for future generations. This study will serve as a crucial basis for crafting effective intervention plans by the authority. By understanding the patterns and dynamics of environmental crimes over a significant period, the authority will be equipped with invaluable insights to develop targeted prevention, enforcement, and restoration strategies.

Keywords: Ecocrime; Environmental law enforcement; Hazardous waste disposal; Illegal wildlife trade; Pollution.

Introduction

Environmental crime is an illegal act that directly harms the environment. These illegal activities involve the environment, wildlife, biodiversity, and natural resources. It covers the activities that breach environmental legislation and cause significant harm or risk to the environment, human health, or both (Luttenberger, 2017).

These illegal operations involved wildlife and natural resources in the environment (Mateo-Tomás et al., 2019). An environmental crime is illegal conduct that can negatively impact our lives (Brantingham, 2017). It is an illegal act. It is a crime committed against nature. This term can refer to the actual crime, in the sense that the act is illegal by the country's law or a moral crime that may not be illegal. Environmental crime has been extremely profitable in recent years and has swiftly expanded into criminal activities (Walters, 2017). As a result, it has become an issue in several sections of the country (Krugman, 2022). Although "wildlife" initially referred to those wildlife forms, it has since broadened to include any living organism that develops naturally or exists in the wild without human intervention (Waldau, 2016).

Wildlife, or animals and birds utilized in hunting, was occasionally referred to as such (Wilmers et al., 2017). Then, depending on the system, there are many types of wildlife (Kadykalo et al., 2018). There are biodiversity-rich wild animals in mountains, hills, meadows, woods, trees, and other areas, particularly in the most densely populated types (Knight et al., 2016). As a result, many beneficial practices that such a large amount of nature to be damaged by human activities aside from the fact that perhaps the term "environment" was often used

to represent wildlife that was never formed by various activities (Castree, 2013). Creatures can sometimes endanger people's lives, property, and security (Wildavsky, 2022). Although some birds are dangerous to people, they are nonetheless loved (White, 2013). The value may be monetary here since the information from the past people often distinguishes between society and wildness in a range of circumstances, including legal, social, and moral contexts (Tetlock et al., 2022). Certain species, however, have adapted to living situations (Williams, 2018). Most religions value unique wildlife, and environmental concerns have led campaigners to criticize the use of wildlife for entertainment or economic benefit (Kopnina, 2013).

Global pollution is a concern (Zhang et al., 2022). Polluted air should be moved to locations where no one lives, even though metropolitan areas are often more polluted than rural areas (Bolund, 2021). The Antarctic ice sheet, for example, has been revealed to contain chemicals (Lamy et al., 2014). The big Pacific garbage patch would be a large collection of microscopic plastic litter in the central Pacific Ocean (Lebreton et al., 2018). Water and air weather systems cause environmental degradation (Alloway et al., 2018). Contaminants in the environment are broadly spread by circulation patterns or moving animals (Beyer et al., 2016). Substances unintentionally emitted from a nuclear reactor could be gathered by air and spread globally (Ajibadi et al., 2021). These pollution production lines traverse international borders (Neiburger, 2016).

Illegal logging is defined as chopping down trees, transporting them, or exploiting their products, such as lumber, for economic advantage in violation of the law (Tacconi et al., 2017). Many of the Philippines' indigenous forests have been ravaged by illegal logging, threatening biodiversity, destroying livelihoods, and creating hazardous environmental conditions (Le Tran et al., 2020). To protect our children's future, immediate action is necessary. To preserve our nation's legacy, we must combat all forms of forest degradation while being vigilant and determined (Marshall, 2016). Under RA 460, the amending law of PD 705 declares the common violations committed recorded in the province, such as the violation under Sec. 68 declaring the cutting, gathering, or collecting timber or other forest products without a license. The most serious types of environmental crimes – include several primary categories, such as wildlife crimes, pollution crimes, illegal fishing, and illegal logging. The main problems bugging Misamis Occidental are its poverty, heavily attributed to low productivity in the agricultural sector, and the bad condition of its terrestrial and coastal environment (Jalonen et al., 2022).

One potential gap in the study on generating the five-year trends of environmental crimes in the Province of Misamis Occidental is the need for a comprehensive analysis of the socio-economic factors contributing to these offenses. While the study aims to analyze the trends and provide a basis for crafting intervention plans, it may not delve deeply into the underlying social and economic contexts that drive environmental crimes. Understanding the socio-economic factors is crucial as it can shed light on the motivations, incentives, and socio-cultural dynamics that lead to environmental crimes. Poverty, unemployment, lack of alternative livelihood options, and weak enforcement mechanisms can significantly influence individuals and communities to engage in illegal activities that harm the environment.

By examining the socio-economic factors associated with environmental crimes, the study can provide a more holistic understanding of the root causes and develop interventions that address the underlying issues. This

analysis can inform the authority about the need for targeted interventions, such as creating sustainable livelihood opportunities, raising awareness, and strengthening enforcement measures in specific socio-economically vulnerable areas. Addressing this gap would enhance the effectiveness of the intervention plans by considering the socio-economic dimensions of environmental crimes.

It would enable the authority to develop more comprehensive strategies that tackle the underlying causes and provide sustainable solutions, thereby promoting long-term environmental protection and socio-economic development in Misamis Occidental. A potential gap in the study lies in the limited focus on the perspectives and experiences of local communities and stakeholders affected by environmental crimes. While the study aims to analyze trends and inform intervention plans, it may not adequately capture the voices and perspectives of those directly impacted by these offenses.

Understanding the experiences, perceptions, and needs of local communities and stakeholders is crucial for developing context-specific and participatory intervention plans. By engaging with affected communities, environmental organizations, indigenous groups, and other stakeholders, the study can gain valuable insights into the on-ground realities, local knowledge, and community-based initiatives that can address environmental crimes (Abdu et al., 2022). This gap can be addressed by incorporating qualitative research methods, such as interviews, focus groups, or participatory workshops, to capture the perspectives of different stakeholders (Ochi & Zaman, 2022). This approach would provide a more comprehensive understanding of the social, cultural, and economic dynamics related to environmental crimes in Misamis Occidental. It also ensures that intervention plans are inclusive, responsive, and reflective of the needs and aspirations of the local communities, leading to more effective and sustainable outcomes.

By bridging this gap, the study can contribute to the development of evidence-based intervention plans and considerate of the local context, empowering the authority to implement targeted strategies that resonate with the community and facilitate long-term environmental protection in Misamis Occidental. By examining the five-year trends of environmental crimes, the study aims to provide a comprehensive overview of the scope and magnitude of such offenses in Misamis Occidental. This understanding is crucial for the authority to grasp the severity of the problem and prioritize their efforts accordingly. Analyzing the trends will enable the identification of specific areas within the province and activities more susceptible to environmental crimes. This knowledge is essential for the authority to effectively allocate resources, personnel, and enforcement measures, targeting the areas with the highest incidence rates.

The study will explore the underlying causes and factors contributing to environmental crimes. By identifying these root causes, such as lack of awareness, inadequate enforcement, or economic incentives, the authority can develop proactive measures to address them effectively. This approach can lead to long-term solutions by tackling the fundamental issues that give rise to environmental crimes. Generating accurate and reliable data on environmental crimes will empower the authority to make evidence-based decisions. The study will provide a factual basis for evaluating the effectiveness of current intervention plans and developing new strategies as needed. This data-driven approach ensures that resources are utilized efficiently and interventions are tailored to address

the challenges faced in Misamis Occidental. By understanding the trends of environmental crimes, the authority can develop intervention plans that align with the principles of sustainable development. Effective interventions can protect the province's natural resources, preserve biodiversity, mitigate pollution, and promote a healthy environment for both present and future generations.

Overall, the rationale for conducting this study lies in the urgent need for accurate information and analysis to guide the authority in crafting effective intervention plans. By understanding environmental crime trends, causes, and patterns, the authority can make informed decisions and implement targeted strategies to combat these offenses, protect the environment, and ensure sustainable development in Misamis Occidental.

Methods

This study utilized a quantitative analysis of the collected data to identify trends and patterns in environmental crimes. Use statistical methods, such as descriptive statistics, charts, and graphs, to visualize and interpret the trends over five years. The researcher used the design to explain phenomena, opinions, behaviors, and other defined variables through numerical data collection and statistical analysis. The descriptive-correlational design was appropriate for this study, as it described the environmental crimes in Misamis Occidental. The descriptive information was gathered from the crime reports retrieved for the Provincial Police Office at Camp Naranjo Headquarters, Lower Lamac, Oroquieta City, Misamis Occidental.

The study was conducted in Misamis Occidental. The Province of Misamis Occidental is located in northern Mindanao, in the southern part of the country, 800 km south of the capital city of Manila. There are 531,680 inhabitants and an area of 2,055 square kilometers. The Province is named after the early settlement of the Spaniards at the entrance to penguin bay. The name Misamis is believed to have been derived from the subanen word "kuyamis," a variety of coconut, the staple food of the early settlers. Other unverified historical sources, however, suggest that the name Misamis came from "Misa" after the catholic mass. After the war, Misamis became a chartered city by republic act 321 on July 16, 1948. Figure 2 shows the target area for the experiment.

The researcher obtained approval from the College of Criminology of Misamis University to conduct the study. After the approval, the researcher asked permission from the Office of the Department of Environment and natural resources (DENR) to acquire raw data. The researcher then sent a consent letter to the DENR office explaining the purpose of the study. The data gathered were tallied through Excel and computed digitally. The results were presented in tabular forms for analysis and subsequent interpretation of data.

The researchers obtained informed consent from the Provincial DENR as the vital office during the data collection of the important data needed for this study. Ensuring that they understand the purpose, procedures, and potential risks and benefits of their participation, protect the confidentiality and privacy of the organization by obtaining their consent for data collection, storage, and dissemination. Ensure that participation in the study is voluntary, and they can withdraw without repercussions. Avoid coercion or undue influence and respect the autonomy and rights of individuals.

It is right to safeguard the privacy and confidentiality of the organization's personal information and research data. Implement appropriate measures to protect sensitive data, such as encryption, anonymization, and secure storage.

They handle the research data responsibly and ensure its integrity, accuracy, and security. Follow best data collection, management, analysis, and storage practices to protect the data from unauthorized access or misuse. Conduct research with integrity, honesty, and transparency. Communicate the research purpose, methodologies, and potential limitations to stakeholders, including participants, supervisors, and the broader academic community. Take precautions to minimize potential physical, psychological, or emotional harm to participants or stakeholders. If there is a possibility of harm, develop strategies to mitigate risks and provide appropriate support or referrals. Disclose any potential conflicts of interest that may influence the research or its outcomes. Maintain objectivity and impartiality in data collection, analysis, and interpretation. Respect intellectual property rights and give proper credit to the works of others through accurate citations and references. Establish authorship guidelines and acknowledge contributions from collaborators or research assistants. Lastly, disseminate research findings accurately and responsibly, ensuring they are not misrepresented or misinterpreted. Give credit to all contributors and acknowledge funding sources appropriately.

To determine the data and to be able to arrive at conclusions, the following method is used.

The formula for calculating crime trends can vary depending on the specific context and data available. However, one common approach to examining crime trends is calculating the crime rate over a specific period. The crime rate is typically calculated as the number of crimes divided by the population at risk, multiplied by a constant (usually 1,000 or 100,000) to express the rate per 1,000 or 100,000 population.

The formula for calculating the crime rate is as follows:

$$\text{Crime Rate} = (\text{Number of Crimes} / \text{Population at Risk}) * \text{Constant}$$

These are the following statistical tools used in this study; time Series was utilized in determining the highest rate of environmental crime in Misamis Occidental.

Results and Discussions

Environmental Crime per year

Table 1 shows the frequency and percentage of environmental crimes committed over a period with a time series of five years, from 2017 to 2021, in the province of Misamis Occidental. The data indicates that there has been a consistent increase in the number of environmental crimes committed each year. In 2018, it got the highest score with 14 cases or 42.42%, and in the year 2017 got the lowest percentage of 1 or 3.03%. Based on the provided data, which indicates the number of environmental crimes for each year from 2017 to 2021, we can observe the following trends: The number of environmental crimes appears to fluctuate over the five years. There is no consistent increase or decrease in the number of crimes yearly. Spike in 2018, the year 2018 stands out with a relatively high number of environmental crimes (14 cases) compared to the other years. This indicates a potential increase in illegal activities or improved reporting and documentation of such crimes during that specific year. The remaining years show varying numbers of environmental crimes, with 2017 and 2019 having relatively low incidences (1 and 3 cases, respectively), while 2020 and 2021 show moderate numbers (9 and 6 cases, respectively).

The provided data on the number of environmental crimes for each year from 2017 to 2021 has several implications: The significant increase in environmental crimes in 2018, with 14 reported cases, suggests a potential spike in illegal activities during that year. This calls for a closer examination of the factors contributing to this surge, such as changes in enforcement efforts, economic conditions, or other contextual factors. The varying numbers of environmental crimes in different years (ranging from 1 to 14 cases) indicate a degree of inconsistency and fluctuation in the occurrence of such crimes. Understanding the underlying reasons for these fluctuations is crucial to develop targeted intervention plans and allocating resources effectively. The data span five years, allowing for identifying trends over time. While no clear linear trend is evident from the given data, a more extended analysis could help determine if any patterns are emerging or if the variability is consistent. The fluctuating nature of environmental crimes suggests the authorities' need for flexible resource allocation. They should be prepared to respond effectively during years with higher crime rates and maintain vigilance even during periods with lower reported incidents. The data provides a starting point for crafting intervention plans to address environmental crimes in Misamis Occidental Province. By analyzing the trends and understanding the contextual factors, authorities, and stakeholders can develop targeted strategies, allocate resources appropriately, and focus on areas with higher incidences or increasing trends. The data underscores the importance of monitoring and evaluating environmental crime rates. Regular data collection and analysis can help identify emerging trends, evaluate the effectiveness of intervention measures, and guide policy adjustments to mitigate environmental crimes more effectively.

It is essential to note that the implications outlined here are based solely on the provided data. Additional contextual information, qualitative data, and stakeholder perspectives should be considered to gain a comprehensive understanding of the implications and develop effective strategies.

Table 1. Environmental Crime Per Year

(Inventory of Criminal Case Involving Apprehended, Confiscated and/or Seized Forest Products and Conveyances)

Year	Frequency	Percentage
2017	1	3.03
2018	14	42.42
2019	3	9.09
2020	9	27.27
2021	6	18.18
Total	33	100.00

Types of Environmental Crimes Committed and Recorded

Table 2 This table shows the frequency and percentage of different environmental crimes committed based on the sections of the law that were violated. The data shows that most environmental crimes in Section 68, with 19 total

scores of 57.57%, were committed under PD 705. In contrast, a smaller proportion of crimes in Section 43 and Section 68, with Sections 5&77 getting the same score of 1 or 3.03%, were committed under PD 705 and RA 460. This law section pertains to the cutting, gathering, and collecting timber or other forest products without a permit. The second most common crime is under Section 77, which had a frequency of 8 and a percentage of 27.59. This law section pertains to using fire to clear land without a permit.

There were also two less common crimes committed: Section 43 and 68 with a frequency of 1 and a percentage of 3.45, which pertains to forest occupancy and timber cutting without a permit, and Section 5&77 with a frequency of 1 and a percentage of 3.45, which pertains to the use of fire in a land without a permit, causing property damage, and endangering public safety.

Table 2. Types of Environmental Crimes Committed and Recorded

Environmental Crimes Committed	Frequency	Percentage
Section 68	19	57.57
Section 77	12	36.36
Section 43 and 68	1	3.03
Section 5&77	1	3.03
Total	33	100.00

Laws and Regulations in placed to prevent Environmental Crimes

Table 3 shows in the table provide information on the frequency and percentage of laws violated in environmental crimes. The data shows that most environmental laws violated are PD 705, with 26 in total, or 89.66%, and PD 705 and 460, with 3 in total, or 10.34%. PD 705, also known as the Revised Forestry Code of the Philippines, is an important law that governs the management and utilization of the country's forest resources. This data suggests that violations of this law are particularly prevalent among environmental crimes and may require increased attention and enforcement efforts. The small percentage of crimes committed under PD 705 and RA 460 may indicate that violations of multiple laws in environmental crimes are less common or may suggest that these particular laws are less likely to be violated in conjunction with each other.

The provided data on the distribution of environmental crimes across different sections of legislation has several implications: Focus on PD 705: The majority of environmental crimes, accounting for 57.57% of the total score, were committed under Section 68 of PD 705. This indicates that timber or forest product extraction offenses without proper authorization or licenses are more prevalent in the study area. Authorities and policymakers should prioritize addressing these violations and focus on strengthening enforcement and penalties related to PD 705. The data shows that a smaller proportion of crimes (3.03% of the total score) were committed under PD 705 and RA 460, specifically under Sections 43 and 68. This suggests an overlap or intersection of legislation related to environmental crimes. Authorities must consider these overlaps and ensure coordination and consistency in enforcing and prosecuting offenders under different applicable laws to address these crimes effectively.

The prevalence of offenses under specific sections of legislation highlights the need for improved legal awareness and compliance among individuals and entities involved in activities related to timber or forest products. Education and outreach efforts can raise awareness about the legal requirements, the potential consequences of non-compliance, and the importance of sustainable resource management practices. The distribution of environmental crimes across different sections of legislation indicates the need for periodic policy and legislative reviews. This can help identify gaps or inconsistencies in existing laws, regulations, and enforcement mechanisms. Policymakers can use this information to enhance or amend legislation to address emerging challenges and ensure more effective enforcement. Addressing environmental crimes requires a collaborative and multi-sectoral approach.

The data highlights the need for cooperation and coordination among various stakeholders, including law enforcement agencies, environmental agencies, local communities, and relevant industries. A holistic approach that combines law enforcement, education, community engagement, and sustainable development initiatives can contribute to more effective intervention plans. The data emphasize the importance of ongoing monitoring and evaluation of environmental crimes and their distribution across different sections of the legislation. Regular data collection and analysis can help identify patterns, assess the effectiveness of enforcement efforts, and inform policy and intervention adjustments. It is crucial to consider the context of Misamis Occidental Province and engage relevant stakeholders in interpreting the implications and designing appropriate intervention plans based on the data provided.

Table 3. Laws and Regulations in place to prevent Environmental Crimes

Laws	Frequency	Percentage
PD 705	26	89.65
PD 705 and 460	3	10.34
Total	29	100.00

Conclusion

The data presented in Table 1, Table 2, and Table 3 provide important insights into the prevalence and nature of environmental crimes committed in Misamis Occidental over the course of five years.

Table 1 indicates that there has been a consistent increase in the number of environmental crimes committed each year. The percentage of environmental crimes relative to the total number of crimes committed also increased steadily each year. This trend highlights the need for greater efforts to prevent environmental crimes from occurring in the future.

Table 2 provides further detail on the specific types of environmental crimes committed and the sections of the law that were violated. Section 68 was the most common law violated, accounting for 65.52% of environmental crimes committed. This section pertains to the cutting, gathering, and/or collecting of timber or other forest products without a permit. Section 77 was the second most common law violated, accounting for 27.59% of environmental

crimes committed, which pertains to the use of fire to clear land without a permit. This information may be useful in targeting enforcement efforts and devising strategies to prevent these types of crimes from occurring.

Table 3 highlights the laws that were most commonly violated in environmental crimes. PD 705, the Revised Forestry Code of the Philippines, accounted for 89.66% of environmental crimes committed. This suggests that violations of this law are particularly prevalent among environmental crimes and may require increased attention and enforcement efforts. The small proportion of crimes committed under both PD 705 and RA 460 may indicate that violations of multiple laws in environmental crimes are less common or that these particular laws are less likely to be violated in conjunction with each other.

Emphasizes the importance of addressing environmental crimes in Misamis Occidental. Increased efforts are needed to prevent such crimes from occurring and to enforce laws and regulations to protect the environment.

Recommendations

Based on the findings and conclusions of the study, the researchers would like to recommend the following:

To the DENR: They may enhance the enforcement capacity of the organization and its partner agencies to combat environmental crimes effectively. This can involve increasing the personnel dedicated to monitoring and enforcement activities, providing adequate training and resources, and establishing strict protocols for investigations, apprehensions, and prosecutions. Foster closer collaboration and coordination between the DENR and other law enforcement agencies, such as the Philippine National Police and the National Bureau of Investigation, to improve the efficiency and effectiveness of efforts to address environmental crimes. Joint operations, information sharing, and coordinated enforcement actions can help disrupt illegal activities more efficiently. Develop and implement comprehensive public awareness campaigns to educate the general public, local communities, and stakeholders about the importance of environmental protection, sustainable resource management, and the consequences of environmental crimes. Promote responsible behavior, encourage reporting of illegal activities, and highlight the benefits of legal and sustainable practices. The DENR can contribute to more effective enforcement, better protection of natural resources, and sustainable development in Misamis Occidental Province and beyond.

To the Community: They may increase awareness among community members about the importance of environmental protection and the negative impacts of environmental crimes. Conduct educational campaigns, workshops, and seminars to educate the entire community about sustainable practices, the value of natural resources, and the consequences of illegal activities. Encourage each community member to be vigilant and report any suspicious or illegal activities related to environmental crimes to the appropriate authorities, such as the DENR or local law enforcement agencies. Establish channels for anonymous reporting to ensure the safety of those reporting.

To the LGU: They may engage barangay officials and local communities in environmental protection efforts. Empower them to enforce local regulations, conduct awareness campaigns, and report environmental crimes within their jurisdictions. Provide support and training to build their capacity as front-line partners in environmental law enforcement.

To the violators: They may voluntarily comply with environmental laws and regulations by obtaining the necessary licenses and permits for timber harvesting or collecting forest products. Take steps to rectify any illegal activities by cooperating with the appropriate authorities and undertaking necessary rehabilitation measures to restore any damage caused to the environment. Seek opportunities to educate oneself about the importance of environmental conservation and sustainable resource management. Participate in training programs or workshops that provide knowledge and skills in legal and sustainable practices related to timber harvesting and forest product collection.

Declarations

Source of Funding

This study did not receive any grant from funding agencies in the public or not-for-profit sectors.

Competing Interests Statement

The authors have declared no competing interests.

Consent for Publication

The authors declare that they consented to the publication of this study.

References

Abdel-Shafy, H.I., & Mansour, M.S. (2016). A review on polycyclic aromatic hydrocarbons: source, environmental impact, effect on human health and remediation. *Egyptian Journal of Petroleum*, 25(1): 107-123. Retrieved from: <https://bit.ly/3ofnSVe> on April 15, 2023.

Abdu, N., Tinch, E., Levitt, C., Volker, P.W., & Mac Donald, D.H. (2022). Illegal firewood collection in Tasmania: Approaching the problem with the Institutional Analysis and Development (IAD) framework. *Land Use Policy*, 118: 106130.

Aceves-Bueno, E., Read, A.J., & Cisneros-Mata, M.A. (2021). Illegal fisheries, environmental crime, and the conservation of marine resources. *Conservation Biology*, 35(4): 1120-1129. Retrieved from: <https://bit.ly/43qcW7c> on April 14, 2023.

Ajibade, F.O., Adelodun, B., Lasisi, K.H., Fadare, O.O., Ajibade, T.F., Nwogwu, N.A., & Wang, A. (2021). Environmental pollution and their socioeconomic impacts. In *Microbe mediated remediation of environmental contaminants*, Pages 321-354, Woodhead Publishing. Retrieved from: <https://bit.ly/3Uv7fQR> on September 22, 2022.

Alloway, B., & Ayres, D.C. (2018). *Chemical principles of environmental pollution*. CRC press. Retrieved from: <https://bit.ly/3A0c6Ra> on April 16, 2023.

Atapattu, S., & Schapper, A. (2019). *Human rights and the environment: key issues*. Routledge.

Banks, D., Davies, C., Gosling, J., Newman, J., Rice, M., Wadley, J., and Fionnuala Walravens (2018). *Environmental Crime: A threat to our future* https://www.unodc.org/documents/NGO/EIA_Ecocrime_report_0908_final_draft_low.pdf.

Barclay, E., & Bartel, R. (2015). Defining environmental crime: The perspective of farmers. *Journal of Rural Studies*, 39: 188-198. Retrieved from: <https://bit.ly/3UITJtG> on April 14, 2023.

Beyer, J., Trannum, H.C., Bakke, T., Hodson, P.V., & Collier, T.K. (2016). Environmental effects of the Deepwater Horizon oil spill: a review. *Marine Pollution Bulletin*, 110(1): 28-51. Retrieved from: <https://bit.ly/3BD0KDa> on September 22, 2022.

Bolund, P., & Hunhammar, S. (2021). Ecosystem services in urban areas. *Ecological economics*, 29(2): 293-301. Retrieved from: <https://bit.ly/3mwEB5O> on April 14, 2023.

Biringer, J., Borzillo, E., Cabarle, B., Chunquan, Z., Collins, D., Contreras-Hermosilla, A., & Taylor, R. (2022). The material and the geographical designations in this report do not imply the expression of any opinion whatsoever on the part of WWF concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. Retrieved from: <https://bit.ly/3L04hkE> on April 14, 2023.

Brantingham, P.L., & Brantingham, P.J. (2017). Environment, routine, and situation: Toward a pattern theory of crime. In *Routine activity and rational choice*, Pages 259-294, Routledge.

Brix, H. (2020). Wastewater treatment in constructed wetlands: system design, removal processes, and treatment performance. In *Constructed wetlands for water quality improvement*. Retrieved from: <https://bit.ly/3A0dUJX> on April 15, 2023.

Castree, N. (2013). Socializing nature: Theory, practice, and politics. *Social nature: Theory, practice, and politics*, Pages 1-21. Retrieved from: <https://bit.ly/3odi7aD> on April 14, 2023.

Broomell, S.B., Budescu, D.V., & Por, H.H. (2015). Personal experience with climate change predicts intentions to act. *Global Environmental Change*, 32: 67-73. Retrieved from: <https://shorturl.at/pIV34> on April 14, 2023.

Chan, F., & Gibbs, C. (2022). When guardians become offenders: Understanding guardian capability through the lens of corporate crime. *Criminology*, 60(2): 321-341.

Cole, C.L. (2016). Resisting the canon: Feminist cultural studies, sport, and technologies of the body. *Journal of Sport and Social Issues*, 17(2): 77-97. Retrieved from: <https://bit.ly/3KEYTC3> on April 14, 2023.

Cook, A., Reynald, D.M., Leclerc, B., & Wortley, R. (2019). Learning about situational crime prevention from offenders: Using a script framework to compare the commission of completed and disrupted sexual offenses. *Criminal Justice Review*, 44(4): 431-451.

Connealy, N.T. (2022). The Influence, Saliency, and Consistency of Environmental Crime Predictors: A Probability Score Matching Approach to Test What Makes a Hot Spot Hot. *Justice Quarterly*, Pages 1-24.

Corcoran, J., & Zahnow, R. (2022). Weather and crime: a systematic review of the empirical literature. *Crime Science*, 11(1): 1-13.

Denney, A.S., Torres, C.E., Oram, C., & Sutton, M.A. (2022). Crime at places of worship: a geospatial analysis. *Criminal Justice Studies*, 35(4): 347-363.

Drew, J.M. (2020). A study of cybercrime victimisation and prevention: exploring the use of online crime prevention behaviours and strategies. *Journal of Criminological Research, Policy and Practice*.

Eck, J.E., & Clarke, R.V. (2019). Situational crime prevention: Theory, practice and evidence. Handbook on crime and deviance, Pages 355-376.

Ferrey, S. (2022). Examples & Explanations for Environmental Law. Aspen Publishing.

Flandroy, L., Poutahidis, T., Berg, G., Clarke, G., Dao, M.C., Decaestecker, E., & Rook, G. (2018). The impact of human activities and lifestyles on the interlinked microbiota and health of humans and of ecosystems. Science of the total environment, 627: 1018-1038. Retrieved from: <https://bit.ly/3L2m0rW> On April 15, 2023.

Freilich, J.D., Chermak, S.M., & Klein, B.R. (2020). Investigating the applicability of situational crime prevention to the public mass violence context. Criminology & Public Policy, 19(1): 271-293.

Freilich, J.D., Gruenewald, J., & Mandala, M. (2019). Situational crime prevention and terrorism: An assessment of 10 years of research. Criminal justice policy review, 30(9): 1283-1311.

Garcia, N.M., López, N., & Vélez, V.N. (2018). QuantCrit: Rectifying quantitative methods through critical race theory. Race ethnicity and education, 21(2): 149-157. Retrieved from: <https://bit.ly/3MLnx74> on April 15, 2023.

Gilman, E. (2015). Integrated management to address the incidental mortality of seabirds in longline fisheries. Aquatic Conservation: Marine and Freshwater Ecosystems, 11(5): 391-414. Retrieved from: <https://bit.ly/407tyhm> on April 14, 2023.

Gong, Y., Dai, M., & Gu, F. (2023). CARESim: An integrated agent-based simulation environment for crime analysis and risk evaluation (CARE). Expert Systems with Applications, 214: 119070.

Goyes, D.R., Abaibira, M.A., Baicué, P., Cuchimba, A., Ñeñetofe, D.T.R., Sollund, R., & Wyatt, T. (2021). Southern green cultural criminology and environmental crime prevention: Representations of nature within four Colombian Indigenous communities. Critical Criminology, 29: 469-485.

Guerette, R.T., & Aziani, A. (2022). The displacement and convergence of transnational crime flows. In The evolution of illicit flows: Displacement and convergence among transnational crime, Pages 9-25, Cham: Springer International Publishing.

Hansel, C.G., Nacua, S., Seronay, R., Gorospe, M., Gorospe-Villarino, A., Poblete, T., & Gay, W.H.C. (2016). Assessing the Headwaters of Layawan River: Linkage Between the Terrestrial and Aquatic Ecosystems in Mt. Malindang, Misamis Occidental. Biodiversity Research Programme for Development in Mindanao: Focus on Mt. Malindang and Environs. SEAMEO SEARCA, College. Laguna, 73. Retrieved from: <https://bit.ly/3L3kbe0> on April 15, 2023.

Hernández, V., & Armando, B. (2022). An empirical approach to the configurational assumptions of social disorganization theory and routine activities theory. Revista Internacional de Investigación en Ciencias Sociales, 18(1): 63-78.

Hipp, J.R., & Luo, X.I. (2022). Improving or declining: What are the consequences for changes in local crime?. Criminology, 60(3): 480-507.

Hyatt, W.D., & Trexler, T.L. (2013). Environmental Crime and Organized Crime: What Will the Future Hold?. In Environmental Crime and Criminality, Pages 245-262, Routledge. Retrieved from: <https://bit.ly/3MQ5Naq> on April 16, 2023.

Inyinbor Adejumoke, A., Adebessin Babatunde, O., Oluyori Abimbola, P., Adelani Akande Tabitha, A., Dada Adewumi, O., & Oreofe Toyin, A. (2018). Water pollution: effects, prevention, and climatic impact. Water Challenges of an Urbanizing World, 33: 33-47. Retrieved from: <https://bit.ly/40fqakq> on April 15, 2023.

Jalonen, R., Ziegert, R.F., Lamers, H.A., & Hegde, N. (2022). From Within and Without: Gender, Agency and Sustainable Management of Non-Timber Forest Products in Two Indian States. Small-scale Forestry, Pages 1-27.

Jeffery, C.R. (2021). Crime Prevention. Through Environmental Design (Beverly Hills: Sage, 1971).

Johnson, M.S. (2020). Regulation by shaming: Deterrence effects of publicizing violations of workplace safety and health laws. American economic review, 110(6): 1866-1904.

Jones, M. (2019). Critical Environmental Theory: Examining the Mainstream Environmental Movement with a Critical Race Theory Analysis. Retrieved from: <https://bit.ly/43MO2iz> on April 15, 2023.