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The Role of Technology in Revealing and Handling Environmental Crime: A Literature Review

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Abstract

This study explores the role of technology in uncovering and addressing environmental crimes and identifying strategies and solutions to enhance environmental protection through technological innovation. The legal research method through literature review is employed to examine various written sources such as books, journals, legal documents, and previous research reports.

The findings indicate that remote sensing technology and drones (UAVs) play a significant role in environmental monitoring and law enforcement. Remote sensing technology allows for wide and accurate monitoring of environmental changes, such as deforestation and pollution. Meanwhile, drones provide flexibility in surveying and inspecting hard-to-reach infrastructure, as well as supporting law enforcement activities, such as detecting environmental crimes.

The use of sensors mounted on drones and related technologies also makes a significant contribution to investigations and law enforcement, enabling the collection of accurate and efficient evidence. Geographic Information System (GIS) technology is also highly effective in mapping the location of environmental crime incidents, assisting in policy planning, and enhancing field coordination. However, the use of this technology also presents challenges related to privacy, data security, and ethics. Strict regulations and careful monitoring are necessary to ensure ethical and legal use. By continuing to develop this technology and considering ethical aspects, the effectiveness of law enforcement and environmental conservation efforts can be enhanced.

Keywords: Technology, Crime, Environment.

INTRODUCTION

Environmental protection is very important because a healthy environment is the key to human welfare and the survival of other creatures on earth.[i]Efforts to maintain a healthy environment not only have an impact on human health, but also on the balance of the ecosystem and the sustainability of economic development.[ii]Therefore, the role of technology in uncovering and handling environmental crimes is becoming increasingly important in maintaining the sustainability of our environment.[iii]

However, in the midst of rapid industrial development and urbanization, actions that damage the environment are increasingly occurring, including environmental crimes.[iv]Environmental crimes often involve economically and politically powerful actors, and occur on a wide scale, both at the local and international levels. Environmental crimes can include illegal deforestation, hazardous waste dumping, and poaching, all of which are difficult to monitor conventionally.[v]In addition, environmental law enforcement is often hampered by limited human, financial and technological resources.

In this context, modern technology offers great potential to overcome these challenges. One technology that can be used to detect a crime is drones which are increasingly being used in policing in many countries, because drones can help police officers detect danger and respond to incidents with timely and low-cost services.[vi]

This research will explore the role of technology in uncovering and dealing with environmental crimes, as well as identifying strategies and solutions to improve environmental protection through technological innovation. Based on this, this discussion will outline the role of technology in uncovering and handling environmental crimes through a study of various literature.

METHOD

The legal research method through literature review is an approach that focuses on reviewing various written sources such as books, journals, legal documents and previous research reports. [vii]to understand and analyze certain legal topics or issues. The steps in this method include identifying research topics, searching for relevant literature, selecting literature based on credibility and relevance, evaluating and analyzing literature, and synthesizing information to provide a comprehensive picture of the topic being researched. The advantages of this method are its ability to provide a broad view of existing knowledge without requiring direct participation from research subjects, as well as efficiency in terms of resources. However, this method also has limitations because it only relies on available secondary data and does not produce new empirical data. Thus, literature reviews are an important approach in legal research, especially in identifying trends, gaps and implications of existing findings, as well as providing a strong basis for further research.

RESULTS AND DISCUSSION

Remote sensing technology and satellite imagery have become very effective tools in monitoring and detecting suspicious environmental changes.[viii]Satellite imagery enables extensive and continuous observation of the Earth's surface, providing accurate and up-to-date data. Remote sensing technologies, such as satellite imagery, thermal infrared sensors, aerial surveys, seismic ground sensors, and heart rate monitors, are becoming sophisticated response tools to wildlife and forestry crime. They enable extensive and accurate monitoring, detect suspicious changes, and track illegal activities, increasing the effectiveness of law enforcement and environmental conservation.[ix]

Research conducted by Debiyanti, Debiyanti, Dadang Gunawan, and Setyo Budiyanto. Entitled "Use of Sensing Technology in Determining Distribution Patterns of Marine Biota to Prevent Illegal Fishing in the North Natuna Sea to Support the National Defense System," revealed thatAdvances in sensing technology, such as radar, satellites and UAVs, have made a major contribution to efforts to monitor Illegal Fishing. By using radar, controllers can effectively detect the presence of ships in the ocean and track their movements in real-time. Satellite imagery also plays an important role in monitoring, allowing watchdogs to monitor the oceans widely and accurately, and identify suspicious vessels. Meanwhile, the use of UAVs allows direct monitoring in areas that are difficult to reach or dangerous for patrol vessels, thereby expanding the scope of monitoring. With the combination of this technology, inspectors can more efficiently detect and take action against vessels engaging in Illegal Fishing, as well as protect valuable marine resources.[x]

Furthermore, the application of satellite data and advanced analysis techniques has proven very valuable in a global context, especially in Kalimantan and Sumatra, as explained by Hein de Wilde (2023) in an article entitled How Satellite Data Is Used to Detect Deforestation, revealing that the rapid expansion of oil palm plantations has become a serious threat to the forests rich in biodiversity on these two islands. Conservation activists have used satellite data to monitor changes in land use, especially in detecting new roads being built. These roads are often the precursor to logging and plantation activities that destroy forests.[xi]

With the ability to detect these changes remotely, early intervention can be done to prevent further damage. Additionally, satellite data also enables more effective advocacy efforts, by targeting specific companies or supply chains responsible for the change. Thus, the application of this technology provides a very effective tool for conservation activists to protect forests and biodiversity in Kalimantan and Sumatra.

One of the main applications of this technology is in forest monitoring. Satellite imagery can be used to detect deforestation and forest degradation in real-time, allowing authorities to take immediate action against illegal activities such as illegal logging. Apart from that, this technology is also able to identify changes in water quality in rivers, lakes and seas, as well as monitor the spread of pollution and oil spills that can damage aquatic ecosystems.

The use of drones, or Unmanned Aerial Vehicles (UAV), is increasingly popular in surveillance of hard-to-reach areas. Drones can be flown over areas that are not easily accessible to humans, such as dense forests,

mountains, or large industrial areas. The use of drones is a good tool for mapping, search and rescue, transportation, and training.

Drones are also very useful in carrying out detailed inspections of infrastructure that has the potential to pollute the environment, such as factories, mines and oil refineries. They can take images and video from various angles and heights, providing powerful visual evidence for law enforcement. This is also explained in the research of O Brian, D. and Hovsha, J. (2022) entitled Drone Use Cases and their Privacy Impacts: A Taxonomy'[xii]explained that the use of drone-mounted sensors and related technologies have become invaluable instruments in investigations and law enforcement. These sensors enable the collection of evidence and recording critical information regarding the location of an accident or criminal incident with high accuracy and in a relatively short time. This facilitates the investigation of legal violations and the prosecution of criminals more efficiently.

In addition, in the context of enforcing the statutory functions of regional authorities, the use of sensors installed on drones also provides significant benefits. Drones can be used to collect evidence regarding regulatory violations in an area, where local authorities have a role in investigation or law enforcement. Thus, this technology plays an important role in supporting the investigation and law enforcement process at the local level.

However, the use of this technology also raises a number of challenges, especially related to data privacy and security. It is therefore important for parties involved in the use of drones and related technologies to carefully consider and regulate these aspects to ensure that the use of these technologies remains within an appropriate legal framework and takes into account applicable ethical principles.[xiii]

With a combination of remote sensing technology and the use of drones, detection and handling of environmental crimes can be carried out more effectively and efficiently. This technology not only enhances monitoring capabilities but also provides accurate data for further analysis and informed decision making.

The article The Effectiveness of Drone Equipment in Police Activities in Police Technology Magazine (2020) explains that drones can survey crime scenes to verify suspicious activity, improve situation analysis and threat assessment. They provide detailed information to support movement coordination on land or other terrain. In complex, fast-moving situations such as counter-terrorism or large public protests, drones can serve a critical role with visual, thermal cameras, loudspeakers and spotlights to provide warnings and minimize the occurrence of further acts of violence.[xiv]

Geographic Information System (GIS) Technology in Law Enforcement for Environmental Crimes. GIS is a very effective tool for mapping the location of environmental crime incidents and supporting investigations and decision making. With GIS, law enforcement can integrate various types of geographic and non-geographic data, such as illegal logging locations, waste dumping points, and illegal transportation routes, to better understand the scope and impact of environmental crimes. This mapping helps in planning more effective and targeted law enforcement actions. This is in line with research fromFahui Wang entitled Why police and policing need GIS: an overview (2012), explains thatSix key areas of application of GIS in policing and policing are discussed with case studies to illustrate the value of GIS as a partner for field officers, a crime investigation and prevention tool, a policy implementation and evaluation tool, a police planning tool, a tool for testing crime theories, and a communications tool. This article also discusses several emerging trends in the application of GIS in the police field.[xv]

Furthermore, based on the research results of the Environmental Case Decision Study Report, Nur Syarifah, et al from the Indonesian Institute for Independent Judiciary's Judicial Independence Study and Advocacy Institute (LeIP) (2020) stated that in the process of proving environmental cases in Indonesia, judges consider various pieces of evidence, including letters. The documents that the judge will consider include satellite images or location maps, permits, laboratory test results, environmental documents and media coverage.

Satellite images or location maps are used to provide a visual depiction of the location of the incident or environmental conditions that are the object of the case. Permits are used as evidence that the defendant has violated applicable rules or regulations. Laboratory test results provide scientific evidence of the environmental conditions that are the object of the case, while environmental documents provide information related to environmental conditions. Media coverage is used to show that the defendant's actions have come to public attention or have been reported by the mass media, which can be used as evidence of the social or environmental impact of the defendant's actions. These details show that the evidentiary process in environmental criminal cases requires comprehensive and diverse analysis to ensure justice and truth in enforcing environmental law.

Picture. Evidence Judges Consider in Environmental Civil Decisions

Klasifikasi	Keterangan Ahli	Surat				
		Citra Satelit/ Peta Lokasi	Hasil Uji Laboratorium	Dokumen Lingkungan	Izin	Liputan Media
1. Kehutanan	14	12	5	3	8	2
2. Lingkungan	3	-	3	-	1	1
3. Sumber Daya Air	-	-	-	-	1	-
4. Pertambangan	-	-	-	1	-	1
Total	17	12	8	4	10	4

Nur Syarifah, et al. Environmental Case Decision Study Report. Institute for the Study and Advocacy of Judicial Independence (LeIP) Indonesian Institute for Independent Judiciary (2020)

Scientific evidence is also recognized in the form of electronic evidence according to Special Provisions Regarding Electronic Evidence (KKMA) No. 36/KMA/SK/II/2013. Recognized electronic evidence includes several types, such as hotspot maps and their interpretations, emails, and satellite images and their interpretations.[xvi]Electronic evidence is recognized as valid evidence in law, with its status as stand-alone evidence. This means electronic evidence can be used to prove facts without having to be supported by other evidence. However, electronic evidence can also be used as independent evidence, provided that it comes from a reliable system and its security is maintained. With this recognition, it is important to ensure the security and authenticity of electronic evidence in law enforcement.[xvii]This recognition of electronic evidence shows the increasing use of information technology in legal processes, which can assist in proving cases, including in environmental cases.

Based on this legal framework, basically the environmental management and protection law, Article 96 letter f, regulates that other evidence includes information conveyed or stored electronically, magnetically, optically, or the like. This also includes data, recordings or information that can be read, seen and heard without the aid of a means, including those written or recorded electronically. This article recognizes the use of electronic evidence in legal proceedings.[xviii]Thus, the development of the use of technology in uncovering and handling environmental crimes has a legal basis so that the use of technology as evidence in environmental crimes is legal and a more sophisticated type of technology is needed in terms of preventing environmental damage as a preventive measure such as the use of drones and the use of intelligence. artificial (AI).

CONCLUSION

From the literature research that has been presented, it can be concluded that remote sensing technology and drones (UAVs) have a significant role in environmental monitoring and law enforcement. Remote sensing technologies, such as satellite imagery, enable widespread and accurate monitoring of environmental changes, such as deforestation and pollution. Meanwhile, drones provide flexibility in surveying crime scenes and inspecting hard-to-reach infrastructure, as well as supporting law enforcement activities, such as detecting environmental crimes and handling emergencies.

The use of drone-mounted sensors and related technologies also makes an important contribution to investigations and law enforcement, enabling accurate and efficient evidence collection. GIS technology is

also a very effective tool in mapping the locations of environmental crime incidents, assisting in policy planning and implementation, as well as improving coordination and communication between field officers. However, the use of this technology also raises challenges related to privacy, data security and ethics. Therefore, there is a need for strict regulation and careful monitoring of the use of these technologies to ensure that they are used in an ethical and legally compliant manner. By continuing to develop this technology and paying attention to these aspects, we can increase the effectiveness of law enforcement and environmental conservation efforts in the future.

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