

Crime Reporting and Analysis Through the Geographic Information System-Based Management: Enhancing the Anti-Illegal Drugs Operations in the Northern Part of Oriental Mindoro

PMAJ Lyndon Carl L. Zamora¹, PCOL Ferdinand Z. de Asis¹,
PhD (Ret.), Romae R. de Asis, PhD¹, Maria Krisia Fae D.
Hernaez, MPA¹

¹*Metro-Dagupan Colleges Institute of Graduate Studies and Research, Pangasinan, Philippines.*

Email of Corresponding Author: lyndoncarlzamora2@gmail.com

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Abstract

This study assessed the implementation of a geographic information system-based management approach for enhancing anti-illegal drugs operations in the northern portion of Oriental Mindoro, covering Calapan City and the municipalities of Victoria, Naujan, Pola, Baco, San Teodoro, and Puerto Galera. Anchored in Intelligence-Led Policing, environmental criminology and hot-spot analysis, community policing, Theory of Change, and Social Control Theory, and grounded in the Revised Philippine National Police Operational Procedures, the research employed a quantitative descriptive design. Primary data were gathered through a validated and highly reliable researcher-made survey questionnaire administered to 204 purposively selected police commissioned officers, non-commissioned officers, and non-uniformed personnel directly involved in Crime Information Reporting and Analysis System encoding and anti-illegal drugs work. Weighted means showed that the geographic information system was highly implemented across intelligence and crime record maintenance, tactical planning and response, and community integration. Problems related to personnel were rated less serious, while those concerning administrative support and facilities and equipment were serious. Pearson correlation analysis revealed no significant relationships between implementation levels and the problems encountered. The high level of implementation is currently sustained by personnel resilience and adaptive workarounds rather than robust infrastructure, rendering it unsustainable without reform. Recommendations include continuous ring-fenced funding for system maintenance and backup power, dedicated non-uniformed personnel for spatial encoding, GPS-enabled mobile devices for patrol units, and formal data-privacy protocols to protect community informants. The study contributes to Sustainable Development Goal 16 by strengthening evidence-based institutions and the rule of law. It advances institutional and community sustainability through data-driven policing that improves resource allocation, cross-border coordination, and trusted public participation in public safety.

Keywords: Anti-Illegal Drugs Operations; Community Integration; Crime Information Reporting and Analysis System; Geographic Information System; Intelligence-Led Policing; Northern Oriental Mindoro; Personnel Capacity; Predictive Policing; Tactical Planning and Response

1. Introduction

The effectiveness of anti-illegal drugs operations depends on data accuracy and minimized record latency for real-time analysis. A GIS-based system converts field reports into actionable intelligence linked to geographic coordinates. Northern Oriental Mindoro towns face heightened risk due to direct logistical chains from Metro Manila via expressways and the Isla Verde Passage, high RORO volumes that hinder thorough inspections, tourism creating markets and cover in Puerto Galera, denser economic activity in Calapan and Victoria, unmonitored coastlines used by private bangkas, and San Teodoro's position as a transit artery with mountainous cover near Mount Halcon. Local intelligence notes that smaller stations with fewer personnel and assets become soft targets. CIRAS standardizes data but faces textual silos (vague alpha-numeric locations impeding cross-jurisdictional tracking), intermittent connectivity forcing reliance on error-prone physical blotters, and primarily administrative rather than proactive use. GIS addresses these by visualizing the drug supply chain (maritime drop-offs, highway transit, distribution nodes), optimizing limited resources via hotspot identification for predictive deployment, and enabling cross-border interdiction through unified maps of the northern corridor. Sample GIS views convert CIRAS data into spatial maps, while entry-point mapping highlights coastal and highway vulnerabilities.

Foreign literature underscores predictive policing's need for regulatory frameworks balancing safety and rights (National Academies of Sciences, Engineering, and Medicine, 2025). GIS enables proactive identification of trouble zones by overlaying environmental and social data (GIS Navigator, 2025) and real-time visualization that reduces response times (T-Kartor, 2024). Global synthetic drug expansion, including record methamphetamine seizures, requires advanced monitoring of trafficking flows (UNODC, 2025; Drug Enforcement Administration, 2025). Place-based prevention concentrates resources on micro-locations rather than random patrols (Braga & Weisburd, 2022). Spatial topology of narcotics networks is shaped by coasts, highways, and borders, allowing GIS to map environmental features against arrest data for choke-point establishment (Andresen & Hodgkinson, 2023). Real-Time Crime Centers rely on continuous spatial mapping for situational awareness (Ferguson, 2022). Sustainability of smart policing depends on funding, maintenance, and training to overcome administrative friction (Meijer & Wessels, 2023). Geographic databases serve as boundary-spanning tools against jurisdictional silos (Sanders & Henderson, 2021). Transparent crime mapping builds public legitimacy and encourages intelligence sharing (Telep, 2022). Mapping crime place networks identifies interconnected nodes rather than isolated hotspots (Modise, 2025). Targeting mid-level logistical nodes disrupts syndicates more than street-level arrests (Manzi & Calderoni, 2024). Algorithmic bias risks from historical data require audits and community balance. Seizures can displace markets and spike overdoses, necessitating public-health coordination (Ray et al., 2023). Rural and provincial forces face distinct challenges of fragmentation, porous coasts, and resource asymmetry requiring contextualized spatial models (Jurkus et al., 2026). UNODC (2024) and related reports call for strategic targeting of apex structures over low-level possession, coordinated intelligence centers, and data-driven disruption rather than reactive tactics. Historic interdictions illustrate exploitation of high-volume commercial routes and the need for multi-agency spatial intelligence.

Local literature traces Philippine GIS roots to the 2012 Cordillera initiative under Magalong, merging e-Blotter with mobile tracking for hotspot visualization, resource precision, and reduced response latency (Philippine National Police – Police Regional Office Cordillera [PRO-COR], 2012; Geospatial World, 2012; Manila Standard, 2012). The Philippines remains a transshipment hub, with efforts against linked operators noted positively (Global Initiative Against Transnational Organized Crime, 2025). International analyses highlight the shift to intelligence-driven interdictions and GIS for high-value targets (Jensen & Hapal, 2024). Mindoro's porous northern coastline has been exploited, with successful interceptions relying on spatial intelligence. Syndicates shift landing zones to provincial coasts as urban pressure increases, requiring mapping of blind spots. Adoption challenges in the Global South include infrastructure and funding shortfalls (Bowling et al., 2023). GIS and predictive mapping safeguard civil liberties by supporting evidence-led warrants (Alston & Goodman, 2025). Methamphetamine supply from the Golden Triangle necessitates overlaying shipping data with local GIS. Community-level intelligence from Barangay Anti-Drug Abuse Councils is fragmented; spatial platforms can unify it (Curato & Ong, 2024). Data quality and encoding protocols are critical for predictive accuracy (Ridgeway, 2024). Unified geographic databases eradicate jurisdictional blind spots (Storey, 2025). Recent Mindoro seizures of hundreds of kilograms underscore the shift to drones, LiDAR, and predictive defense (Philippine Information Agency, 2026; SunStar Manila, 2026). Spatial analysis of maritime transshipment confirms RoRo and bangka exploitation of coastal blind spots (Mendoza & Cruz, 2025). The recalibrated "bloodless" campaign emphasizes high-value targets and spatial records, yielding major seizures (Philippine Information Agency, 2025). Pre-operation intelligence bottlenecks include technological and mobility deficits (Villanueva et al., 2024). The Dangerous Drugs Board's national GIS maps prevention programs and rehabilitation sites. CIRAS functions largely as a static filing cabinet due to textual silos; dedicated GIS integration is recommended (Reyes & Santos, 2024). Community intelligence transmission remains delayed by paper systems (Curato & Ong, 2024). Unfunded mandates and LGU funding gaps hinder sustainability in lower-class municipalities (Pineda, 2023). Precision tools enhance legitimacy and reduce arbitrary actions (Bautista & Dela Cruz, 2025). AI extraction of geographic entities from digital devices can feed GIS for pattern detection (Tolentino & Cabrera, 2026).

Foreign studies confirm big-data predictive policing's accuracy when balanced with transparency (Lee et al., 2024b). Spatiotemporal geo-visualization with deep learning forecasts short-horizon activity (Salcedo-Gonzalez et al., 2023). Data-pedigree systems map cocaine networks by integrating seizure and geospatial records. Regression and GIS evaluate police-vehicle-crime causality and patrol effectiveness (Lima et al., 2024). BIM-GIS optimizes patrol routes via vulnerability indices (Lee et al., 2024a). Smart-city GIS supports rapid response (Brzeziński & Wyrwicka, 2022). Strict data-quality standards underpin counterdrug databases (McSweeney, 2020). External asset records corroborate geographic footprints (Tellman et al., 2020). Big data reduces randomness in organized-crime investigation (Adam & Fazekas, 2025). Spatial substantiation accelerates complaint-to-investigation transitions. Quantifiable spatial data supports probable-cause justification. Evidence-led approaches reduce reliance on intuition (Mydlowski & Turner-Moore, 2025). Broader contextual mapping informs interventions (Evans et al., 2021). Standardized frameworks enhance deterrence in cross-border networks. Generative models extract spatial entities from narratives (Lee, 2023). Conversational interfaces aid spatial queries. Community-engaged participatory strategies improve outcomes. Decentralized administration and limited data access constrain situational awareness (Opach et al., 2023). High costs and complexity limit personnel capabilities without training and equipment. Intelligent application by trained personnel plus hardware/software modernization is required (Goniewicz et al., 2020). Administrative support, governance, and resistance to change hinder integration. Departmental siloing collapses efficiency without integrated sharing mandates (Aljobaly et al., 2025). Continuous training and resource allocation must be institutionalized. Unstable infrastructure and inadequate equipment cause disruptions (Ketaren et al., 2025). Fragmentation and resource constraints impede standardization (Muvungani et al., 2025). Specialized GIS hardware beyond basic computers is essential. AI value-chain mapping tightens border OODA loops against hybrid threats (Outram & Swartz, 2026). Decentralized synthetic production frustrates traditional interdiction (Eligh, 2024). Global drug use outpaces population growth amid instability; responses must target market infrastructure while treating users with dignity (UNODC, 2025). Cartels rely on international logistics of precursors, requiring continuum targeting (DEA, 2025). Myanmar seizures highlight instability-driven production surges (Associated Press, 2026). Procedural justice predicts legitimacy and voluntary cooperation (Lee et al., 2024a). Theory of Change frameworks map diversion to health supports (Botschner et al., 2023). Place-based interventions succeed only when accompanied by informal social control and trust (Dickens et al., 2023). Bias mitigation in proactive stops requires training even in data-driven hotspots (California Department of Justice RIPA Board, 2024). National strategies invest heavily in AI and big-data architecture (White House, 2024).

Local studies reaffirm the Cordillera GIS benchmark and Magalong-era gains. Geospatial analysis in neighboring Albay supports targeted interventions. CIRAS remains an electronic filing cabinet without spatial translation capacity (Reyes & Santos, 2024). BADAC intelligence is accurate but delayed; shared spatial tools can bridge gaps (Villanueva et al., 2024). Coastal forces need GIS-hotspot mapping with mobile patrols (Mendoza & Cruz, 2025). LGU capital outlay is essential against unfunded mandates (Pineda, 2023). Digital literacy gaps and generational resistance require continuous training (Bautista & Dela Cruz, 2025). GIS-guided checkpoints outperform random patrols (Garcia et al., 2026). Digitized spatial monitoring streamlines barangay drug-clearing validation. Technology Acceptance Model findings show resistance among senior officers; ease of use and mentoring are needed. Coastal municipalities function as transit zones requiring predictive models of highways, ports, and topography (Cabrera & Tolentino, 2025). Socio-demographic profiles link demand to low-income urban deficits (De Leon & Garcia, 2024). Community-based rehabilitation faces counselor and funding shortfalls (Soriano et al., 2025). Maritime units need radar, AIS, and oceanographic mapping (Tolentino & Ramos, 2025). Internal corruption ("ninja cops") nullifies technology without strict chain-of-custody and oversight (Castaneda, 2024). Burnout among specialized operatives requires institutional mental-health support (Bautista, 2026). Provincial cyber-forensics capacity lags national levels (Mercado & Villanueva, 2025). Independent auditing of BADAC data against spatial and health records is needed (Ocampo, 2026). Spatial-economic analysis links informal settlements to market embedding, calling for multi-sectoral urban renewal (Cruz & Delos Reyes, 2025). Procedural justice and body-worn cameras correlate with higher reporting willingness (Garcia et al., 2026). A closely related foreign study on geospatial trafficking mapping provides a useful basis for comparison with the local provincial application. Opach et al. (2023) and Ketaren et al. (2025) address administrative and infrastructural realities relevant to the second phase of the inquiry.

Globally, synthetic drug markets expand rapidly, with record seizures and transnational organizations exploiting logistics, encryption, and geopolitical gaps (United Nations Office on Drugs and Crime [UNODC], 2024 & 2025; Drug Enforcement Administration [DEA], 2025; Global Commission on Drug Policy, 2025). Historic interdictions in the Caribbean, Washington State, South Korea, Myanmar, and Dominican Republic illustrate high-volume commercial concealment and the necessity of multi-agency spatial intelligence. Nationally, the Philippines serves as a transshipment hub; the recalibrated campaign prioritizes high-value targets and intelligence-led seizures, while CIRAS digitizes records yet remains largely non-spatial (Reyes & Santos, 2024; Philippine Information Agency, 2025). The Dangerous Drugs Board's GIS maps prevention and treatment assets (Dangerous Drugs Board, 2025). Locally, northern Oriental Mindoro's archipelagic geography, Nautical Highway corridor, and proximity to Batangas create the primary entry gateway; southern inland areas and Occidental Mindoro coasts fall outside the studied provincial jurisdiction. Coastal stations face resource asymmetry exploited

by syndicates. Recent Mindoro seizures confirm maritime vulnerabilities and the push toward drones and LiDAR (Philippine Information Agency, 2026; SunStar Manila, 2026).

The study is grounded in Revised PNP Operational Procedures (2021) hybrid blotter–CIRAS reporting. Intelligence and Crime Record Maintenance draws on Intelligence-Led Policing, in which criminal intelligence and data analysis form the primary framework for proactive, spatio-temporal resource deployment (Khalfa & Hardyns, 2023; Burcher & Whelan, 2024; Ahmad et al., 2024). Tactical Planning and Response is supported by Environmental Criminology and Hot Spot Analysis: crime concentrates where offender and target activity spaces intersect; spatial mapping enables predictive focus on micro-locations rather than random patrols (CAP Index, 2024; Connealy, 2025; Vári, 2024). Community Integration rests on Community Policing and digital co-production, emphasizing collaborative trust-based partnerships, bidirectional feedback, trust in anonymity, and willingness to participate (Arefin & Rahman, 2026; Alehegn et al., 2026; Lee et al., 2024a; Jain et al., 2021; Graduate School of Northern Illinois University, 2021). Theory of Change provides a pragmatic map of intermediate steps linking GIS inputs to outcomes, preventing reliance on unidimensional solutions and integrating health and social supports (Botschner et al., 2023; Bacon, 2026). Social Control Theory explains why interventions succeed: informal bonds, attachment, and custodianship drive reporting and deterrence beyond formal apprehension (Dickens et al., 2023; Li et al., 2025). The conceptual paradigm transforms CIRAS textual silos into GIS spatial outputs that drive the three operational pillars toward enhanced anti-illegal drugs operations. Despite CIRAS standardization, provincial application suffers textual data silos that hinder tracking of contiguous, cross-border patterns; infrastructure gaps that force reliance on damaged or delayed physical records; and reactive rather than predictive use. Existing foreign and local studies demonstrate GIS efficacy in hotspot analysis, network disruption, and community engagement, yet few examine the specific interplay of intelligence maintenance, tactical response, and community integration under the resource, administrative, and infrastructural constraints of northern Oriental Mindoro's coastal transit corridor. Gaps persist in personnel technical capacity, continuous administrative funding and protocols for inter-station sharing, and specialized facilities (power, connectivity, mobile GPS, coastal surveillance). The study addresses these by assessing implementation levels, problems encountered, relationships between them, and recommendations for sustainable institutionalization, thereby operationalizing ILP, environmental criminology, and community policing in a high-vulnerability Philippine provincial setting.

The research aligns principally with SDG 16 (Peace, Justice and Strong Institutions) by strengthening evidence-based, accountable policing, reducing jurisdictional blind spots, and enhancing institutional capacity for crime prevention and interdiction. It supports SDG 3 (Good Health and Well-Being) through disruption of synthetic-drug supply chains that drive addiction and overdose risk. SDG 11 (Sustainable Cities and Communities) is advanced by hotspot-focused resource allocation and community co-production of safety that improve urban and peri-urban resilience. SDG 9 (Industry, Innovation and Infrastructure) is addressed via digital spatial infrastructure and technological modernization of reporting systems. SDG 17 (Partnerships for the Goals) is reflected in cross-border, inter-agency, and police–community collaboration enabled by shared geospatial platforms.

The study contributes to institutional sustainability by diagnosing administrative friction, unfunded mandates, and personnel capacity gaps so that GIS becomes an enduring rather than ad-hoc capability. It advances technological and digital sustainability through spatial conversion of textual records, reducing latency and enabling predictive rather than purely reactive operations. Community sustainability is reinforced by transparent, anonymity-protecting reporting platforms that foster trust and informal social control. Public-health sustainability is served by more precise interdiction that limits market displacement and associated harms. Socio-economic sustainability benefits from disruption of high-volume trafficking corridors that undermine local economies and tourism. Policy and governance sustainability is strengthened by evidence-based recommendations that align local practice with national ILP directives and international best practices, ensuring that limited provincial resources produce durable public-safety outcomes.

2. Material and methods

2.1 Research Design

The study employed a quantitative descriptive research design. This design was selected because it systematically describes the current state of implementation of the geographic information system-based management across the three core variables of intelligence and crime record maintenance, tactical planning and response, and community integration. It also measured the severity of problems encountered by police personnel in the use of the technology with respect to personnel, administrative support, and facilities and equipment.

2.2 Locale of the Study

The research was conducted exclusively in the northern portion of the Oriental Mindoro Police Provincial Office. The specific stations covered were Calapan City Police Station, Naujan Municipal Police Station, Puerto Galera Municipal Police Station, Victoria Municipal Police Station, Pola Municipal Police Station, San Teodoro Municipal Police Station, and Baco Municipal Police Station. These locations were chosen because they constitute the primary high-volume entry and transit corridor for illegal drugs originating from Metro Manila and Batangas,

characterized by extensive coastlines, the Strong Republic Nautical Highway, high RORO traffic, and relative proximity to mainland ports.

2.3 Respondents of the Study

Primary data were obtained from police commissioned officers, police non-commissioned officers, duty investigators, and other key personnel assigned to the seven city and municipal police stations in the northern corridor who were directly involved in the anti-illegal drugs campaign and in the use of the Crime Information Reporting and Analysis System and geographic information system applications. These respondents provided first-hand assessments of the level of implementation of the geographic information system-based management and of the problems they encountered in terms of personnel, administrative support, and facilities and equipment.

2.4 Sample and Sampling Procedure

A purposive sampling technique was employed to select respondents. Only personnel who were actively engaged in crime reporting, intelligence work, investigation, operations, or encoding related to anti-illegal drugs activities and who had direct experience with the Crime Information Reporting and Analysis System and spatial mapping processes were included. This ensured that the data reflected the operational realities of those who use or are affected by the system on a daily basis.

2.5 Research Instrument

A researcher-made survey questionnaire served as the primary data-gathering instrument. The questionnaire was organized into sections that first captured demographic information (station assignment, personnel classification, and role in using the Crime Information Reporting and Analysis System and geographic information system) and then measured the level of implementation of the geographic information system-based management under the three domains of intelligence and crime record maintenance, tactical planning and response, and community integration. A four-point scale ranging from highly implemented to not implemented was used for these items. A parallel section assessed the seriousness of problems encountered along the dimensions of personnel, administrative support, and facilities and equipment, employing a four-point scale from very serious problem to not a problem. The instrument underwent expert validation for content adequacy, clarity, relevance, and alignment with the statement of the problem. Reliability testing using Cronbach's alpha on a pilot group of twenty-seven police officers yielded excellent internal consistency coefficients for both the implementation assessment section and the problems-encountered section, after which the questionnaire was cleared for full administration.

2.6 Data Gathering Procedure

After securing formal approval from the Provincial Director of the Oriental Mindoro Police Provincial Office and obtaining informed consent from participants, the validated and reliability-tested questionnaire was administered to the purposively selected respondents across the seven stations. Respondents were assured of anonymity and confidentiality and were informed that participation was voluntary. Completed questionnaires were collected, checked for completeness, and prepared for encoding and statistical processing. Secondary data consisting of published literature, official Philippine National Police operational directives, historical blotter narratives, and Crime Information Reporting and Analysis System statistics were also reviewed to provide contextual and corroborative support.

2.7 Data Analysis Techniques

Descriptive statistics, specifically the weighted mean, were used to determine the level of implementation of the geographic information system-based management under each domain and to quantify the degree of seriousness of the problems encountered along the three problem dimensions. Pearson product-moment correlation was applied to test the relationship between the level of implementation in the three geographic information system domains and the problems encountered in terms of personnel, administrative support, and facilities and equipment. Results were interpreted according to established descriptive rating scales and significance levels.

3. Results and Discussion

3.1 Level of Implementation of the Geographic Information System-Based Management

3.1.1 Intelligence and Crime Record Maintenance

Respondents assessed the implementation of the geographic information system in intelligence and crime record maintenance as highly implemented. Weighted means for the indicators ranged from the mid-3.60s to the high-3.70s on the four-point scale, producing an overall average that falls within the highly implemented range. The system was rated particularly strong in minimizing record latency through prompt encoding, ensuring data accuracy by converting field reports into actionable intelligence, linking incidents to exact coordinates, translating vague textual locations into precise map points, visualizing the full drug supply chain including maritime drop-offs and Nautical Highway transit routes, enabling audit and update of historical records, integrating multi-unit intelligence into a unified map, and supporting analysis of historical trends and patterns.

These results indicate that frontline personnel successfully convert textual Crime Information Reporting and Analysis System entries into spatial products despite infrastructural constraints. The high ratings align with the core premise of Intelligence-Led Policing that accurate, timely spatial intelligence forms the primary framework for operations and converts raw data into strategic products (Khalfa & Hardyns, 2023; Burcher & Whelan, 2024). The emphasis on geocoding completion and data accuracy rate further supports the observation that linking every drug incident to verifiable coordinates minimizes latency and enables visualization of the supply chain from Batangas ports into the coastal towns (Ahmad et al., 2024).

3.1.2 Tactical Planning and Response

Implementation under tactical planning and response was likewise rated highly implemented, with individual indicator means clustered in the mid-to-high 3.60s and an overall average in the highly implemented band. Respondents indicated that the system enables the shift from reactive to predictive policing through visual hotspot identification, optimizes limited resources by directing personnel and vehicles to exact intersections and barangays of highest activity, tracks and helps neutralize logistical chains along the Strong Republic Nautical Highway, enhances cross-border interdiction via a unified northern-corridor map, supports synchronized dragnet and roadblock operations, provides clear visual briefings for pre-operational planning, allows rapid on-ground route adjustment based on near-real-time updates, and permits post-operation mapping of arrests and seizures to evaluate effectiveness.

The consistently high ratings demonstrate that commanders use spatial intelligence to achieve resource allocation precision and coordinated interdiction even under resource asymmetry. This finding is consistent with environmental criminology and hot-spot analysis, which hold that crime concentrates in specific micro-locations and that focusing assets on data-driven coordinates is more effective than random area-wide patrols (Connealy, 2025; Vári, 2024; CAP Index, 2024). It also reflects the Intelligence-Led Policing claim that timely spatial intelligence enables deployment based on verified necessity rather than intuition (Khalfa & Hardyns, 2023).

3.1.3 Community Integration

Community integration was assessed as highly implemented, with indicator means ranging from 3.60 to the mid-3.70s and an overall average in the highly implemented category. The system was judged effective in providing a transparent and accessible reporting platform, establishing trust in anonymity and data privacy, expanding public awareness and reach to encourage reporting, generating a perception of police responsiveness to data-driven hotspots, increasing community willingness to participate, facilitating feedback through generalized non-sensitive crime maps, guiding Police Community Relations personnel in prioritizing vulnerable barangays for awareness seminars, and supporting joint interventions with barangay officials during coordination meetings.

These results show that the geographic information system functions as a digital bridge that converts passive residents into active sources of spatial intelligence while protecting anonymity. The findings support modern community-policing theory that effective partnerships now rely on interactive digital co-production, transparent data management, and perceived responsiveness rather than static outreach (Lee et al., 2024a; Arefin & Rahman, 2026; Jain et al., 2021). They also illustrate the Social Control Theory proposition that residents' willingness to report is driven by trust, attachment, and feelings of custodianship (Dickens et al., 2023).

3.2 Problems Encountered in Implementation

3.2.1 Problems Along Personnel

Problems related to personnel registered an overall average weighted mean of 2.49, interpreted as a less serious problem. The most elevated indicators, each rated as a serious problem, concerned insufficient numbers of dedicated intelligence and investigative personnel for real-time spatial encoding, difficulty tracking connected crime patterns across municipal borders, and lack of technical skills or training for accurate map plotting that produces vague location descriptions. Remaining indicators—delays caused by structured narrative requirements, resistance to shifting from reactive to predictive methods, difficulty verifying incomplete community reports, over-reliance on instinct rather than map-based evidence, and susceptibility to human error in manual transfer from physical blotters—fell within the less serious range.

Although the composite score is less serious, the three highest-rated items reveal persistent manpower and skills bottleneck that slow real-time mapping and cross-border tracking. These constraints mirror literature noting that successful geospatial adoption is frequently limited by personnel shortages, inadequate specialized training, and the technical complexity of spatial software (Goniewicz et al., 2020). The difficulty of maintaining boundary-spanning awareness further echoes observations that departmental silos and jurisdictional blind spots hinder coordinated interdiction (Storey, 2025).

3.2.2 Problems Along Administrative Support

Administrative-support problems produced an overall average weighted mean of 2.52, classified as a serious problem. The highest-rated indicators, all serious, included insufficient station funds for maintenance, software upgrades and technical support; inadequate continuous specialized training in spatial mapping and Intelligence-Led Policing; lack of clear synchronized protocols for sharing geographic information system intelligence across neighboring stations; overlapping administrative duties that divert commanders from spatial analysis; exploitation

by traffickers of resource disparities between smaller municipalities and city stations; and absence of protocols for cross-referencing law-enforcement records with financial and asset data. Challenges in guaranteeing anonymity for informants and the tendency to treat the system primarily as historical record-keeping rather than a predictive tool were rated less serious.

The serious composite rating indicates that institutional and financial friction, rather than technological absence, constitutes the principal barrier. These findings align with public administration analyses that technological tools often fail to reach operational potential because of administrative friction, unfunded mandates, and insufficient executive support for continuous training and inter-agency protocols (Meijer & Wessels, 2023; Pineda, 2023; Bacon, 2026).

3.2.3 Problems Along Facilities and Equipment

Facilities-and-equipment problems recorded the highest overall average weighted mean at 2.58, interpreted as a serious problem. All eight indicators fell within the serious range. The most elevated concerned frequent power interruptions without reliable backup power that force reversion to physical blotters, inadequate secure communication infrastructure for receiving and plotting anonymous tips, outdated or insufficient computer terminals that slow encoding and mapping, lack of GPS-enabled devices or mobile map access for patrol vehicles, inadequate surveillance and interdiction equipment along unmonitored shorelines, intermittent internet connectivity that delays real-time map updates, reliance on basic offline mapping software unable to support advanced visualization, and physical vulnerability of blotter books to damage and data loss.

These results demonstrate that physical infrastructure constitutes the most acute constraint on real-time spatial operations. The findings corroborate literature emphasizing that procurement of software is insufficient without matching investment in power resilience, connectivity, specialized hardware, and mobile terminals (Ketaren et al., 2025; Muvungani et al., 2025). Coastal surveillance gaps further illustrate the environmental-criminology observation that offenders exploit geographic features where formal controls are weakest (Connealy, 2025).

3.3 Relationship Between Level of Implementation and Problems Encountered

Pearson correlation analysis revealed no statistically significant relationships between any of the three implementation domains and the three problem dimensions. Correlation coefficients ranged from -0.061 to 0.031 , with all corresponding p -values well above the 0.05 significance threshold. Consequently, the null hypothesis of no significant relationship was accepted across the board.

The absence of significant correlations indicates that the high level of implementation is sustained despite the presence of serious personnel, administrative, and infrastructural problems. Personnel appear to compensate through multitasking, informal peer mentoring, personal mobile data, and ad-hoc coordination, thereby maintaining operational output. This resilience is consistent with the Theory of Change perspective that intermediate adaptive steps can still produce desired outcomes even when ideal resources are lacking (Botschner et al., 2023), and with Intelligence-Led Policing literature that stresses the primacy of data analysis over perfect infrastructure (Burcher & Whelan, 2024). At the same time, the findings underscore that continued reliance on human over-performance rather than institutionalized support is unsustainable in the long term.

4. Conclusion & Recommendations

The geographic information system-based management for anti-illegal drugs operations in the northern portion of Oriental Mindoro is highly implemented across intelligence and crime record maintenance, tactical planning and response, and community integration, leading to rejection of the null hypothesis that the system is not implemented. Serious problems exist in personnel capacity, administrative support, and especially facilities and equipment, resulting in rejection of the null hypothesis that no problems are encountered. No statistically significant relationships were found between implementation levels and the problems encountered, confirming acceptance of the corresponding null hypothesis. These outcomes demonstrate that high operational performance is currently sustained by the dedication, multitasking, and adaptive workarounds of frontline personnel rather than by stable technological infrastructure or institutional support, creating a paradox of short-term resilience that remains unsustainable without systemic reform.

Local government units and the Philippine National Police command should establish continuous, ring-fenced funding—preferably through Municipal Peace and Order Councils—for software licensing, secure communication portals, and reliable backup power at all municipal stations. Dedicated non-uniformed personnel should be hired and trained solely for spatial data encoding and analysis, supported by localized mentoring and dual-verification protocols that keep tactical officers focused on field duties. All mobile patrol units and strike teams should be equipped with ruggedized, GPS-enabled digital tablets so that real-time spatial intelligence reaches officers on the ground. Strict, transparent data-privacy policies must be formalized and widely communicated to protect anonymous informants and sustain community reporting.

5. Compliance with ethical standards

This study adhered to established ethical standards for research involving human participants. Formal approval was secured from the Provincial Director of the Oriental Mindoro Police Provincial Office prior to data collection. All respondents provided informed consent after receiving a clear explanation of the study's purpose, procedures, voluntary nature of participation, and their right to withdraw at any time without consequence. Anonymity and confidentiality were strictly maintained; individual identities were not recorded or disclosed, and all data were used exclusively for academic purposes. No vulnerable populations were involved, and the research posed no physical, psychological, or professional risk to participants.

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