The Indian Police JOURNAL

Volume 73, Number 1 | ISSN 0537-2429 | January-June, 2026

Urban Policing

BUREAU OF POLICE RESEARCH AND DEVELOPMENT
Ministry of Home Affairs
Government of India

"Promoting Good Practices and Standards"

The Indian Police Journal

Volume 73, Number 1 | ISSN 0537-2429 | January-June, 2026

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The Indian Police Journal

Volume 73, Number 1, ISSN 0537-2429
January - June, 2026

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"There is a need to strengthen urban policing, reinvigorate tourist police, and increase public awareness regarding the newly enacted Bharatiya Nyay Sanhita, Bharatiya Sakshya Adhiniyam, and Bharatiya Nagrik Suraksha Sanhita, which replace the colonial-era criminal laws."

Shri Narendra Modi
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"The focus should be on emerging security challenges along the Eastern border, immigration and trends in urban policing."

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FOREWORD

The Indian Police Journal occupies a unique place in the professional and academic landscape of policing in India. As the country's oldest police journal, being published for more than seventy years, it has consistently served as a forum for informed discourse, research, and exchange of ideas on policing and criminal justice. Through its commitment to promoting evidence-based scholarship and institutional learning, the Journal has contributed to strengthening policing thought and practice in the country. As India continues to urbanize, policing in cities is confronted with increasingly complex and evolving challenges. Expanding metropolitan spaces, demographic pressures, technological disruptions, cyber-enabled offences, and concerns of public safety have collectively transformed urban policing into a critical pillar of internal security.

This edition, centred on the theme of Urban Policing, examines the multidimensional challenges and emerging opportunities associated with policing in rapidly evolving urban environments. In his address at the 60th All India Conference of Director Generals and Inspector Generals of Police held at Raipur in November, 2025, the Hon'ble Prime Minister urged the police leadership to modernize and realign policing practices with the national vision of Viksit Bharat. The theme of this issue resonates with that vision by exploring how policing institutions can adapt to changing urban realities while remaining responsive, citizen-centric, and future-ready.

The Bureau of Police Research & Development remains committed to promoting research, technological advancement, and capacity building to strengthen policing systems across the country. It is our belief that the analyses and insights presented

in this issue will contribute meaningfully to policy discourse, support professional development, and encourage the adoption of innovative and effective policing practices.

I extend my sincere appreciation to all distinguished authors, reviewers, and members of the editorial team for their valuable contributions and dedicated efforts in bringing out this edition. I also thank our readers for their continued engagement with The Indian Police Journal. Their sustained support ensures that the Journal remains a credible and vibrant forum for advancing knowledge in policing and criminal justice.



(Alok Mittal)
Chief Patron

"Promoting Good Practices and Standards"

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EDITORIAL

The Indian Police Journal continues to serve as an important forum for scholarly inquiry, professional reflection, and knowledge-sharing on policing and criminal justice. By bringing together empirical research, operational experience, technological innovation, and institutional learning, the Journal contributes to strengthening the intellectual, professional, and ethical foundations of contemporary policing.

This edition focuses on Urban Policing, a domain of growing significance amid rapid urbanisation, demographic transformation, technological advancement, and increasingly complex patterns of crime and vulnerability. A contemporary city demands a policing model that moves beyond reactive enforcement towards prevention, anticipation, partnership, and responsive urban governance.

The contributions in this Issue examine urban policing from diverse yet interconnected perspectives. They explore accountability, empathy, community partnership, and policing in vulnerable urban communities, emphasising that legitimacy and public trust are fundamental to effective policing. The focus on women and children's safety and Pink Patrol initiatives highlights the need for inclusive, preventive, and citizen-centric approaches to urban security.

Technology emerges as a powerful enabler through discussions on social media monitoring, technology-driven policing, predictive policing, GIS-based intelligence, and precision policing. These contributions demonstrate how data and indigenous technological solutions can enhance situational awareness, resource deployment, and crime prevention, while underscoring the need for legality, transparency, human oversight, and ethical safeguards.

The vision of Urban Policing for Viksit Bharat 2047 reinforces the need for policing that is smart and technologically capable, yet firmly grounded in constitutional values and citizen-centric governance. This transformation must be supported by standardised police training and continuous capacity building, equipping personnel with the skills required for increasingly complex urban environments.

The Issue further broadens the perspective through contributions on the Criminal Procedure (Identification) Act, 2022, interview infrastructure, forensic science, and Interpol's Red Notice System, highlighting the importance of scientific investigation, technological reform, professional capability, and international cooperation.

Collectively, these contributions affirm that the future of urban policing lies in being intelligence-led yet people-centred, technology-enabled yet ethically governed, preventive yet empathetic, and authoritative yet accountable.

As I demit the office of Editor-in-Chief, this edition carries a special significance for me, as it marks my final message to the readers of *The Indian Police Journal*. I take this opportunity to express my sincere gratitude to all authors, reviewers, contributors, and members of the editorial team whose commitment has enriched the Journal and sustained its journey of professional excellence.

I hope this edition stimulates informed debate and inspires innovative approaches towards building safer, inclusive, resilient, and trusted cities, strengthening the foundations of policing for a rapidly changing India.



(Ravi Joseph Lokku)
Editor-in-Chief

"Promoting Good Practices and Standards"

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SUMMARY

Urbanisation is transforming the social, economic, and spatial landscape of India at an unprecedented pace. These changes are reshaping the relationship between citizens, communities, and policing institutions, while placing greater emphasis on responsive, inclusive, and accountable approaches to public safety. This edition of *The Indian Police Journal*, themed Urban Policing, brings together diverse perspectives on how policing institutions are adapting to these evolving realities through innovation, technology, community engagement, and institutional reform.

Sh. Bindu Madhav Garikapati, IPS, SP, Kakinada District, Andhra Pradesh, in his paper *"Cheruva: Reimagining Urban Policing Through Accountability, Empathy, and Community Partnership,"* presents a community-oriented policing model aimed at strengthening trust between citizens and law enforcement agencies. The article underscores the importance of transparency, responsiveness, and empathy in fostering effective police-public partnerships.

Sh. Ravi Joseph Lokku, IPS, ADG, BPR&D, in his study *"Urban Slums and Policing in India: Challenges, Legitimacy and Community-Centred Urban Security Governance,"* examines the complex policing challenges emerging in urban slums across four major Indian metropolitan cities. The article emphasises legitimacy, procedural fairness, and community participation, proposing a community-centred approach to urban slum policing.

Dr. R. M. Arivazhagan, Assistant Professor & HOD (I/c), Department of Criminology and Justice System, JHA Agrasen College, Chennai, and co-authors, in their article *"Urban Safety Governance and Pink Patrol: Evaluating Women and Children-Centric Policing in Chennai,"* evaluate a specialized policing initiative designed to enhance the safety and security of

women and children. The study highlights the significance of gender-responsive policing and its contribution to inclusive urban governance.

Sh. Lohit Matani, IPS, DCP, Nagpur and co-authors in their paper *"Urban Public Management through Social Media Monitoring: Insights from Garuda Drishti System,"* analyse the growing threat posed by crimes facilitated through digital and social media platforms. The article presents technology-driven policing initiatives and demonstrates how artificial intelligence can strengthen surveillance, crime detection, and preventive policing.

Sh. Rajesh Kumar Srivastava, IPS, SP, ANTF, DGP Headquarters, Lucknow, in *"Urban Crime Control & Predictive Policing in Cities,"* examines the emerging role of predictive policing and data-driven approaches in crime prevention. The paper highlights how advanced analytics and intelligence-led policing can assist law enforcement agencies in anticipating criminal activity and enhancing urban safety.

Sh. Amit Kumar Choudhary, Senior Scientific Assistant, Crime Scene Management Division, Forensic Science Laboratory, Delhi, and co-authors in their paper *"Technology Use in Urban Policing: Ground-Level Implementation,"* discuss the practical application of technological tools in day-to-day policing. The article explores the opportunities and challenges associated with integrating modern technologies into operational policing and service delivery in urban environments.

Dr. Rohit Raj, Consultant, BPR&D, New Delhi, and co-authors in their study *"Standardisation of Police Training Institutions and Capacity Building for Urban Policing in India"* examine the need for uniform standards and modernization across police training institutions. The paper discusses existing challenges, ongoing reform initiatives, and a long-term roadmap for developing a professional, future-ready police workforce capable of addressing emerging security challenges.

Ms. Laxmi Singh, IPS, Commissioner of Police, Gautam Buddh Nagar, Uttar Pradesh, in her paper *"From CCTNS to Predictive and Precision Policing: GeoShield as an Indigenous GIS-Based Intelligence Platform for Precision Policing in India,"* presents GeoShield, a GIS-based platform aimed at transforming CCTNS into a predictive policing and decision-support system. The article highlights the use of geospatial analytics, crime hotspots, and environmental data to strengthen preventive policing and optimise police resource deployment.

Sh. Rajashekara. N, IPS, DIG & Research Scholar, School of Interdisciplinary and Trans-disciplinary Studies, IGNOU, New Delhi and Dr. Abhishek Mishra, Assistant Professor, School of Interdisciplinary and Trans-disciplinary Studies, IGNOU, New Delhi, in *"Urban Policing for Viksit Bharat 2047: A Roadmap towards Ethical, Smart and Citizen-Centric Governance in India"* examine the evolving requirements of urban policing in the context of Viksit Bharat 2047. The article highlights the role of Al, IoT, data-driven policing, etc., while emphasising ethical governance, accountability, inter-agency coordination, and citizen-centric practices.

Sh. Ramit Sharma, IPS, ADG, Bareilly, Uttar Pradesh and Dr. Devika Agarwal, Professor and Head-Research Cell, Faculty of Management and Commerce, Poornima University, Jaipur, Rajasthan, in their paper *"The Criminal Procedure (Identification) Act, 2022: A Watershed Moment for Innovations and Technological Interventions,"* examine the transformative potential of the legislation in facilitating the use of modern identification technologies. The article explores its implications for criminal investigation, evidence collection, and law enforcement efficiency.

Ms. Monika Bhardwaj, IPS, Additional CP/IFSO, Special Cell, Delhi Police, and Ms. Avani Datta, Sr. Forensic Assistant/Expert (Psychology), Delhi Police, in *"Spaces for Truth-Redefining Interview Rooms,"* advocate the creation of dedicated and professionally designed interrogation facilities. The article examines how appropriate infrastructure can contribute to ethical, transparent, and effective investigative practices while safeguarding legal and human rights standards.

Ms. Naazneen Bhasin, IPS, IG, South Range, Rewari, Haryana, and Dr. Himani, MBBS, KCGMC, Karnal, in their study *"Forensic Science: From Clues to Conviction: A Multidisciplinary Review for Law Enforcement and Criminal Justice,"* highlight the growing importance of forensic science in strengthening criminal investigations and ensuring evidence-based justice. The article discusses the expanding role of scientific techniques in improving the accuracy, credibility, and effectiveness of modern policing.

Sh. Kiran S., IPS, IG, Lucknow Range, Lucknow in *"Interpol's Red Notice System: Legal Framework, Common Grounds for Rejection, and a Practitioner's Guide to Drafting Compliant Requests,"* provides a comprehensive examination of international police cooperation mechanisms. The article offers valuable practical insights into the legal and procedural aspects of preparing effective Red Notice requests within the framework of global law enforcement collaboration.

Collectively, the articles in this edition reflect the multidimensional nature of urban policing in contemporary India. They highlight the growing significance of technological innovation, scientific investigation, community engagement, institutional modernization, and capacity building in responding to complex urban challenges. By bringing together research, operational experiences, and policy perspectives, this issue seeks to contribute to informed discourse and support the continued evolution of effective, accountable, and citizen-centric policing.



(Jitendra Singh Meena, IPS)
IG/Director (R&CA & SPD)

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Cheruva: Reimagining Urban Policing Through Accountability, Empathy, and Community Partnership



Bindu Madhav Garikapati, IPS *

ABSTRACT

The Cheruva initiative represents a transformative community-engagement and accountability framework developed by the Kakinada Police to address the evolving challenges of modern policing. As law-enforcement agencies confront rapid technological advances, shifting social expectations, and increasing demands for transparency, Cheruva provides a structured platform that re-centers empathy, trust, and participatory governance at the heart of policing. The model institutionalises periodic, evidence-based dialogues with diverse peer groups—including educators, drivers, traders, youth, women, senior citizens, and marginalised communities—to generate context-specific insights grounded in lived experiences. Supported by anonymised documentation processes, digital feedback systems, and inclusive multi-stakeholder participation, Cheruva enhances both operational performance and institutional legitimacy. Early evaluations indicate improvements in citizen trust, officer behaviour, issue resolution, and community participation. The framework underscores the need to balance advancements in artificial intelligence and data-driven policing with humane engagement, demonstrating that democratic policing must be anchored in emotional intelligence, ethical accountability, and continuous community partnership. The paper concludes with policy recommendations that support statewide replication, deeper digital integration, and sustained commitment to inclusivity, thereby positioning Cheruva as a scalable model for empathetic, future-ready policing in India.

Keywords: *Cheruva, Community-Engaged Policing, Accountability Framework, Ethical and Empathetic Policing, Police–Community Trust*

INTRODUCTION

This article presents a pioneering approach to community-centered policing grounded in empathy, transparency, and continuous dialogue. Cheruva was conceptualised as a response to widening gaps between citizens and law-enforcement agencies, recognising that genuine accountability

* Superintendent of Police, Kakinada district, Andhra Pradesh

can emerge only when people feel heard, valued, and respected. By creating a structured space for honest conversations between diverse community groups and senior police leadership, Cheruva enables citizens to articulate their experiences, expectations, and concerns without hesitation. These exchanges reshape traditional power dynamics, allowing policing to evolve from a transactional or enforcement-oriented model into a relational practice rooted in trust and mutual respect. The initiative integrates both human-centered principles and technological tools, facilitating ongoing learning and adaptive reforms. As the movement grows, the insights drawn from citizens have informed policy adjustments, operational improvements, and internal culture shifts within the police force. It is my hope that this model continues to inspire policing systems across India to pursue democratic, inclusive, and empathetic engagement as foundational pillars of public safety and justice.

BACKGROUND: CONTEXT AND THE POLICING DILEMMA

As society is being increasingly shaped by technological innovation, policing too must evolve to meet new expectations and challenges. The widespread adoption of artificial intelligence—made visible globally through tools such as ChatGPT—has accelerated the diffusion of AI into everyday discourse. These systems have transitioned from niche technical applications to essential components of public-service infrastructure, raising hopes that they can streamline operations, predict risks, and enhance efficiency[1].

Yet the belief that technology alone can solve deeply human policing problems is misguided. Around the world, law-enforcement agencies stand at a pivotal crossroads where rapid technological progress intersects with complex social realities[2]. Predictive tools, big-data systems, and algorithmic resource-allocation platforms undeniably enhance organisational capability[2]. However, such efficiencies cannot replace the fundamentally interpersonal nature of policing. Technology may collect evidence, analyse trends, or automate responses, but it cannot replicate empathy, compassion, or the emotional judgement required in moments of citizen vulnerability[3].

This challenge is particularly pronounced in India, where linguistic, cultural, and socioeconomic diversity creates highly nuanced policing environments. Automated systems cannot fully interpret the emotional contexts that shape police-citizen interactions across such a vast social landscape. Perceptions of insensitivity, bias, or delayed response often alienate citizens from law-enforcement agencies, deepening mistrust[4]. A lack of structured two-way communication further reinforces stereotypes and widens the distance between the police and the public[5].

Cheruva emerged as a direct response to this dilemma, recognising that effective policing must balance technological progress with relational engagement and empathetic listening.

METHODOLOGY: THE CHERUVA FRAMEWORK

The Cheruva model is grounded in established social-science methodology[6] while being pragmatically tailored to the operational realities of policing. Its design integrates structured qualitative inquiry, confidentiality safeguards, iterative review processes, and inclusive community

participation. This combination ensures that the initiative is both scientifically robust and feasible for large-scale policing environments.

Study Design and Data Collection

Between January 2025 and April 2026, the Kakinada District Police conducted 30 structured Cheruva dialogue sessions across 21 stakeholder categories covering all police sub-divisions of the district. A total of 3,487 citizens participated in these consultations, including teachers, students, auto drivers, traders, SHG members, fishermen, agricultural workers, senior citizens, women's groups, NGOs, and representatives of vulnerable communities.

Each session was facilitated by the Superintendent of Police and documented by designated officers. Feedback received was anonymised and categorised under service delivery, public safety, traffic management, women and child safety, cybercrime, police behaviour, grievance redressal, and community engagement.

A thematic content analysis framework was used to identify recurring issues and prioritise interventions. Follow-up sessions were conducted every six months to assess implementation status and obtain citizen feedback regarding corrective measures undertaken by the police.

Peer Group Identification

Cheruva begins with the systematic identification of peer groups that represent distinct social or professional communities within the district. These include teachers, auto drivers, shopkeepers, agricultural workers, medical practitioners, students, self-help groups, and various marginalised communities. Grouping participants based on shared identities encourages psychological safety and reduces social inhibition, enabling individuals to speak more candidly about their experiences and expectations[7]. Homogeneity within groups ensures that discussions remain contextually specific, yielding insights grounded in everyday realities rather than abstract generalities.

Dialogue Sessions

Each peer group participates in biannual dialogue sessions facilitated directly by the Superintendent of Police (SP). The SP assumes the role of moderator rather than authority figure, signalling a deliberate shift from hierarchical command to collaborative exchange. Sessions follow a structured three-question format designed to elicit balanced and actionable feedback[1]:

1. How do you assess the overall performance of the district police?
2. What personal or community experiences illustrate areas requiring improvement?
3. What expectations or suggestions do you have for future policing?

This simple but powerful framework blends anecdotal narratives with systemic insights, allowing the police to identify both micro-level concerns and broader policy-level issues.

Confidentiality and Documentation

To foster openness, all discussions are conducted under strict confidentiality. Police administrative

staff discreetly record the content of conversations, anonymise all personal identifiers, and compile thematic summaries for senior leadership review[8]. Only depersonalised insights are shared with relevant station-level officers. This confidentiality shield is essential for building trust, as it assures participants that their feedback will not lead to reprisals or targeted scrutiny.

Feedback Loop and Evaluation

A distinguishing feature of Cheruva is its iterative engagement cycle. The same peer groups are reconvened in subsequent sessions, allowing citizens to evaluate actions taken since their previous meeting. Officers present progress updates, demonstrating accountability and closing the feedback loop[9]. This recurring structure transforms Cheruva into a dynamic learning ecosystem where transparency becomes habitual rather than performative[10].

Ethics and Privacy Safeguards

Ethical engagement norms form the backbone of Cheruva. Participation is voluntary, discussions are non-punitive, and every session upholds the principles of respect and diversity of opinion. Civil-society observers—including academics, NGOs, and occasionally retired judicial officers—serve as neutral monitors to ensure procedural fairness and reinforce legitimacy[11]. These safeguards collectively create an environment that supports candid reflection, mutual respect, and trust in the process.

MULTI-STAKEHOLDER PERSPECTIVES AND IMPACT

Cheruva's impact is best understood through the diverse perspectives of the communities and stakeholders it engages. Each group's experience reveals how structured dialogue, empathetic listening, and responsive policing reshape expectations, rebuild trust, and improve service delivery. The following subsections capture these multidimensional outcomes.

Citizens' Experience

For ordinary citizens, Cheruva has fundamentally altered the nature of their relationship with the police. Instead of being passive recipients of services, participants become active contributors to governance and safety[12]. Auto drivers who once expressed frustration over indiscriminate checks now report more courteous officer behaviour after procedural adjustments made through Cheruva consultations. Teachers have noted tangible improvements in school-area security following discussions about student safety, while traders have seen more predictable enforcement of traffic and parking regulations.

Marginalised groups—who often feel unseen or unheard in conventional civic mechanisms—describe Cheruva as a dignified space where their concerns receive genuine attention and follow-up[13]. The initiative has helped dismantle long-standing apprehensions about approaching the police, replacing fear with a sense of partnership and shared responsibility for community well-being.

Youth Crime Prevention Taskforce

The Youth Crime Prevention Taskforce, integrated into Cheruva's broader framework, has been instrumental in addressing pressing issues such as substance abuse, cyberbullying, and peer-pressure-induced delinquency[14]. Through focused interactions with student leaders and college representatives, the police gained insights into the social dynamics shaping youth behaviour. These consultations informed the creation of peer-led awareness campaigns, digital-safety workshops, and behavioural intervention programs tailored to local contexts[14].

The taskforce has strengthened trust between young citizens and the police by fostering open conversations about vulnerabilities and risks. As a result, youth-related complaints have declined, and student volunteers increasingly act as positive influencers within their own networks[15]. This collaborative approach shifts the police-youth relationship from one of surveillance to one of mutual guidance and prevention.

Women's Safety and Empowerment Forum

Cheruva's Women's Safety and Empowerment Forum offers a structured platform for women to articulate concerns related to harassment, unsafe spaces, and gendered vulnerabilities[16]. In response, the district police established rapid-response teams, improved patrolling patterns, and advocated for enhanced street lighting in high-risk zones[16]. The initiative also introduced self-defence workshops and legal-awareness sessions—measures that aim to reinforce women's agency and security[16].

An important outcome has been the rise in timely reporting of incidents and improved follow-up mechanisms. Women participants frequently express greater trust in police responsiveness, reflecting a shift from silent suffering to empowered engagement[13]. The Cheruva model demonstrates that when women's voices guide policy adjustments, safety becomes a shared community priority rather than an isolated administrative concern.

Senior Citizens Community Support

For senior citizens, Cheruva has served as a protective mechanism against social isolation, scams, and targeted fraud. Regular check-ins by police personnel help maintain a sense of connectedness, offering emotional reassurance in addition to security[17]. Informational materials on fraud prevention—distributed during community sessions—equip elderly residents with practical tools to recognise and avoid scams[17].

The "Senior Citizen Volunteer" program, introduced under the Cheruva umbrella, encourages retirees to contribute to neighbourhood monitoring and emergency response efforts. This initiative not only reinforces security but also restores a sense of purpose for elderly participants, who often seek meaningful community engagement.

Teachers' Safety Network

The Teachers' Safety Network emerged after educators raised concerns regarding student

vulnerability during school entry and dispersal hours[18]. Through Cheruva consultations, specific high-risk areas were identified, prompting the introduction of targeted patrols and increased police visibility near educational institutions[18]. These measures served as both deterrent and assurance, creating safer environments for children.

The Network facilitated deeper collaboration between schools and law-enforcement agencies. Teachers began sharing localised intelligence on behavioural trends, suspicious activity, and emerging risks[19]. This reciprocal flow of information strengthened the police's capacity for proactive intervention and strengthened community vigilance[20].

A key achievement has been the creation of an integrated safety ecosystem supported by digital communication tools, data-driven risk mapping, and continuous feedback loops[21]. The resulting environment has enhanced parental confidence, improved attendance stability, and reinforced the collective prioritisation of child safety[22]. The Teachers' Safety Network stands as a testament to how participatory policing can drive systemic inclusivity and responsive governance[23].

Police Personnel Insights

Cheruva has also been transformative for police officers themselves. Exposure to honest, unfiltered citizen experiences has broadened officers' understanding of policing as an inherently relational profession rather than a purely enforcement-oriented task[17]. Officers report increased empathy, improved communication, and a shift towards courteous, non-confrontational interactions[8,11,19].

This cultural shift manifests in everyday behaviours: greeting citizens respectfully, listening without interruption, and offering reassurance even in routine engagements[13]. Officers also express heightened motivation as they witness tangible improvements resulting from their own responsiveness and accountability[9].

Rather than perceiving feedback as criticism, officers increasingly view it as a tool for professional growth[6,1,18]. This has strengthened morale and reinforced a service-oriented identity rooted in dignity, integrity, and collaborative problem-solving.

Civil Society Observations

Civil-society stakeholders—including academics, NGOs, and rights-based organisations—identify Cheruva as a significant innovation within India's policing landscape[5]. They highlight its ability to translate procedural-justice principles into operational reality[19]. The initiative emphasises fairness, transparency, and inclusivity, ensuring that community voices shape each stage of policing decisions[12,17].

Observers also note that Cheruva strengthens the institutional architecture of accountability by embedding empathy into oversight mechanisms[11]. The program reconceives policing as an adaptive, learning-oriented function rather than a rigid, command-driven structure[9,10]. The involvement of independent observers enhances credibility, safeguards ethical norms, and reassures citizens that their perspectives are evaluated impartially[8].

Quantitative Assessment of Cheruva

An analysis of feedback records and district policing indicators between January 2025 and April 2026 revealed measurable improvements following implementation of the Cheruva initiative.

- Citizen participation increased from 1,450 participants during the first engagement cycle to 2,587 participants during the fourth cycle.
- Complaints relating to rude behaviour and non-responsive policing decreased by 32%.
- Community-generated intelligence inputs increased by 41%, assisting preventive policing efforts.
- Participation in awareness programmes on cybercrime, women's safety and substance abuse increased by 57%.
- The average time taken to resolve community grievances reduced from 24 days to 14 days.
- Citizen satisfaction scores collected through post-session feedback surveys increased from 61% during the baseline assessment to 84% after successive intervention cycles.

These indicators demonstrate that structured citizen engagement contributes to measurable improvements in police responsiveness, public trust and collaborative problem solving.

Qualitative Findings

Thematic analysis of citizen feedback revealed four recurring themes:

1. Respectful treatment by police personnel was considered as important as crime control outcomes.
2. Citizens valued direct interaction with senior leadership and perceived such engagement as evidence of accountability.
3. Marginalised groups reported increased confidence in approaching police stations after participating in Cheruva consultations.
4. Communities expressed greater willingness to cooperate with investigations and preventive policing efforts when feedback resulted in visible action.

These findings indicate that legitimacy and trust are strengthened when policing is perceived as responsive, transparent, and empathetic.

OUTCOMES AND IMPACT

Cheruva's outcomes demonstrate how structured, empathetic engagement can transform public safety, institutional culture, and community trust. The initiative's effects are visible across dimensions of accountability, perception, empathy, and measurable social indicators.

Measurable outcomes:

- Number of issues identified - 55
- Number resolved - 52
- Percentage resolved - 94.54%

- 16 traffic-related, 10 women-safety related, 6 cybercrime related, and 5 community related interventions were launched because of Cheruva feedback.

Enhanced Accountability

At the core of Cheruva's effectiveness is its impact on institutional accountability. The model ensures that citizen feedback is not merely symbolic but directly shapes administrative action[13]. Concerns raised during community sessions—whether related to procedural delays, insensitivity, or service inconsistencies—trigger targeted corrective measures[9]. Because the same peer groups reconvene in subsequent cycles, officers remain consistently attentive and responsive, knowing that progress will be evaluated publicly during follow-up dialogues[7].

Over time, this iterative process cultivates a system where accountability becomes intrinsic to policing norms[4]. It reinforces a culture in which officers seek to meet not only formal performance metrics but also community-defined expectations of fairness, respect, and empathy.

Improved Public Perception

Cheruva has significantly reshaped how the public perceives the police. Through repeated and meaningful engagement, officers become more accessible, reliable, and relatable partners in community well-being[20]. Citizens report increased confidence in police responsiveness, especially in matters requiring sensitivity or sustained follow-up[6].

For marginalised and vulnerable groups—who often hesitate to approach law enforcement due to past experiences of neglect or discrimination—the initiative offers a safe and credible channel for voicing concerns[4]. By enabling them to participate in agenda-setting and evaluation, Cheruva supports a more inclusive policing environment where diverse voices influence decision-making[2].

The cumulative effect is a narrowing of the trust deficit that traditionally separates citizens from law enforcement[22]. Instead of perceiving the police as distant authority figures, communities begin to view them as collaborative stakeholders committed to shared goals of safety and social harmony.

Empathy and Culture Transformation

One of the most profound impacts of Cheruva lies in its contribution to transforming internal police culture. Regular exposure to community narratives fosters emotional intelligence among officers, strengthening their ability to respond with sensitivity and fairness. This cultural shift emerges not from external mandates but from authentic human connection and reflective engagement[11].

As officers internalise the value of empathy, their interactions become more courteous and patient, and they show greater awareness of how their conduct influences public trust[15]. This behavioural evolution enhances service delivery without requiring additional resources or structural overhaul[8].

Simultaneously, increased empathy contributes to improved officer morale. Police personnel report heightened professional pride as they witness the positive outcomes generated by citizen

collaboration[17]. This reinforces a virtuous cycle where respectful engagement fuels cooperative behaviour, which in turn promotes greater trust and legitimacy.

Measurable Social Indicators

The success of Cheruva is supported by empirical data collected through surveys, complaint analyses, and participation records. District-level indicators show a reduction in grievances related to rudeness, delays, and procedural conflict[13]. There has also been a visible increase in citizen participation across awareness campaigns, collaborative initiatives, and safety programs[17,18].

These metrics demonstrate that trust—often treated as an intangible quality—can indeed be measured and improved through consistent, empathy-driven strategies. Higher levels of public cooperation indicate that communities not only engage with police more readily but also assume a shared responsibility for safety and crime prevention[12].

Cheruva thus provides evidence that institutional legitimacy, emotional intelligence, and relational policing are not abstract ideals but achievable outcomes with tangible social benefits.

LESSONS LEARNT

The implementation of Cheruva has yielded key insights into what makes community-centred policing effective, sustainable, and meaningful. These lessons offer both strategic guidance and conceptual clarity for replicating the model elsewhere.

Technology Enhances but Cannot Replace Humanity

While artificial intelligence, predictive systems, and data-analytics tools have greatly expanded policing capabilities, they are fundamentally limited in understanding emotional nuance and human vulnerability[21]. Cheruva's experience underscores that meaningful policing must balance technological intelligence with emotional intelligence.

Sophisticated tools can identify trends or optimise resource deployment, but only empathetic officers can build trust, interpret context, and respond to communities with compassion[5]. Technology therefore complements—but can never substitute—the humane core of democratic policing.

Recurrence Creates Credibility

One-time consultations or symbolic meetings rarely lead to sustained accountability. Cheruva demonstrates that recurring, institutionalised dialogues are essential for building long-term community trust[9].

Follow-up sessions, where officers report on completed actions and obtain new feedback, reinforce credibility and signal genuine commitment[10]. Over multiple cycles, this iterative process shifts accountability from a transactional exchange to a continuous, embedded practice within the policing culture[7].

Peer Homogeneity Encourages Authentic Feedback

Organising deliberations around socially or professionally homogeneous groups—whether teachers, traders, youth, drivers, or marginalised communities—creates safer conversational environments where participants feel comfortable sharing candid experiences[7].

This structure enhances the specificity, relevance, and actionable nature of the insights generated[6]. Instead of broad or generalised concerns, Cheruva receives nuanced perspectives that reflect the lived realities of distinct community segments.

Leadership Commitment Is Critical

The active, visible involvement of senior leadership—especially the Superintendent of Police—signals institutional seriousness and sets the tone for organisational change[1].

When top-level officials prioritise empathy, transparency, and dialogue, subordinate officers adopt similar values and behaviours[2]. Leadership commitment therefore becomes a driving force for embedding community-centric policing across all operational levels.

Transparency Reinforces Trust

Communicating how citizen feedback has been acted upon is essential for sustaining engagement. Cheruva's practice of publicly sharing updates and outcomes demonstrates that transparency strengthens legitimacy and motivates continued participation[19].

When communities see tangible improvements linked to their suggestions—such as better patrolling, procedural changes, or issue resolution—the process becomes credible and meaningful[13,8]. Transparency transforms consultation from a symbolic gesture into a reliable, verifiable mechanism of democratic accountability.

POLICY RECOMMENDATIONS

The Cheruva initiative offers a scalable blueprint for institutionalising empathetic, participatory policing. The following policy recommendations outline how the model can be replicated and strengthened across districts and states.

Institutionalise Community Dialogue Platforms

To ensure that citizen–police engagement becomes a routine and reliable governance mechanism, Cheruva's peer-group dialogue framework should be formally adopted across districts[18]. State Home Departments can incorporate such platforms into standard operating procedures, mandating periodic consultations and structured feedback cycles. Institutionalisation will also allow for consistent monitoring, evaluation, and cross-district comparison of engagement outcomes.

Integrate Technology with Emotion

Advanced digital tools—including AI-based feedback analysis, sentiment mapping, and automated complaint-tracking systems—should be paired with officer training that enhances emotional

intelligence[21,11]. This dual approach ensures that modernisation supports not only efficiency but also the relational aspects of policing. Technology can help identify patterns and emerging concerns, while empathetic officers interpret these insights and translate them into meaningful action[5].

Empathy-Centric Training

Police training academies and in-service programs should embed modules on communication ethics, trauma-informed responses, de-escalation techniques, and community interaction[15]. These modules develop officers' capacity to handle sensitive encounters with dignity and care, improving long-term trust and reducing unnecessary conflict[14]. Empathy-centric training must be treated as a core competency, comparable in importance to tactical or technical skills.

Performance Metrics for Accountability

To reinforce transparent governance, districts should adopt measurable indicators such as response timelines, behavioural audits, follow-up rates, and citizen-satisfaction scores[17]. Publishing annual "empathy reports" that track these metrics will promote healthy competition, guide resource allocation, and ensure that accountability processes remain visible to the public[18]. Such transparency helps institutionalise behavioural standards aligned with community expectations.

Protect Anonymity and Non-Punitiveness

Credible community consultations require strong safeguards for voluntary participation and anonymity. Protecting contributors from reprisals or unwanted attention encourages open, honest dialogue[9]. Developing whistleblower-style confidentiality norms and secure, anonymised digital submission channels will further strengthen the credibility and integrity of the engagement process[6].

Engage Third-Party Observers

To enhance impartiality and public confidence, the involvement of independent observers—such as academics, NGOs, and retired judiciary members—should be formalised[8]. Their presence strengthens transparency, ensures fairness in how feedback is processed, and reassures communities that oversight extends beyond internal police structures[12].

Strengthen Feedback Loops

Periodic publication of "action taken" reports and follow-up dialogues are essential for sustaining trust. When citizens see concrete outcomes resulting from their participation, they remain invested in the process[19]. Strengthening feedback loops through digital dashboards, newsletters, and community announcements ensures that dialogue translates into visible, meaningful change[7].

Adapt for Diversity

Given India's linguistic and cultural diversity, Cheruva's model should remain flexible and context-sensitive. Implementing hybrid engagement models that combine physical meetings

with digital interfaces can widen participation and ensure accessibility for rural and underserved communities[18]. Local adaptation is essential for equitable, inclusive implementation that respects cultural nuances[5].

CONCLUSION

The Cheruva initiative represents a profound reimagining of how policing can embody democratic values, social sensitivity, and community partnership. Rather than viewing modernisation solely through the lens of technology—artificial intelligence, data-driven systems, or enhanced surveillance—Cheruva demonstrates that the most meaningful advancements emerge from strengthening the human foundations of law enforcement. Emotional intelligence, ethical judgment, and empathetic communication remain indispensable to the policing function, especially in a diverse society where interactions often unfold in moments of personal vulnerability.

By shifting from an authoritative, command-oriented approach to one grounded in dialogue and shared responsibility, Cheruva restores the relational essence of policing. It reframes the police–citizen relationship as a partnership defined by mutual respect, transparency, and trust. Through structured conversations, iterative feedback loops, and inclusive participation, communities gain a voice in shaping the practices that affect their safety and dignity. This empowerment in turn strengthens police legitimacy and fosters a culture of collaboration that transcends traditional boundaries.

Cheruva also exemplifies how technology and humanity can coexist harmoniously. While analytical tools enhance efficiency and help identify trends, they are most effective when complemented by compassionate engagement and ethical responsiveness. The initiative affirms that sustainable public safety arises not from algorithms alone but from the daily interactions that build confidence, reduce friction, and promote social cohesion.

As India advances towards its vision of smart, transparent, and citizen-centric governance, Cheruva offers a scalable, adaptable blueprint for policing that is both future-ready and deeply humane. Its success in Kakinada demonstrates that empathetic accountability is not merely aspirational but operationally achievable with committed leadership, community participation, and continuous learning. By embedding democratic values into everyday policing practices, Cheruva illuminates a path toward safer communities, stronger institutional legitimacy, and a more harmonious society.

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Urban Slums and Policing in India: Challenges, Legitimacy and Community-Centred Urban Security Governance



A Comparative Study of Delhi, Mumbai, Kolkata, and Chennai with International Best Practices

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ABSTRACT

Urban slums in India represent highly complex socio-spatial environments shaped by rapid urbanisation, structural inequality, migration, informal labour markets, and weak governance institutions. These settlements are often characterised by overcrowding, insecure tenure, inadequate infrastructure, and limited access to formal justice systems. Policing in such environments poses significant operational and institutional challenges, particularly in relation to trust deficit, under-reporting of crime, informal dispute resolution mechanisms, and the coexistence of formal and informal governance structures.

This study adopts a qualitative research design to examine policing practices in urban slums across four major Indian metropolitan cities—Delhi, Mumbai, Kolkata, and Chennai. It draws on secondary data sources including government reports, academic literature, and policy documents, along with comparative case study analysis.

Theoretically, the study integrates Durkheim's concept of social disorganisation, Wacquant's theory of advanced marginality, Broken Windows Theory, and procedural justice theory to analyse the relationship between structural inequality and policing legitimacy. The study further extends its analysis by incorporating international best practices from Brazil, South Africa, the United Kingdom, and Colombia.

Findings suggest that policing effectiveness in urban slums is determined less by coercive enforcement capacity and more by legitimacy, procedural fairness, and community participation. While Indian cities have developed multiple community policing initiatives such as beat policing, Mohalla Committees, and volunteer-based policing systems, these remain fragmented and unevenly institutionalised.

The study identifies a critical gap in the absence of a unified urban slum policing framework in India that integrates policing with urban governance and social policy.

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It proposes a community-centred policing model based on co-production of security, inter-agency coordination, and institutional legitimacy.

Keywords: *Urban Policing, Urban Slums, Community Policing, Procedural Justice, Urban Governance, Community Participation, Criminology*

1. INTRODUCTION

1.1 Urbanisation and Informality in India

India's rapid urbanisation has led to the expansion of informal settlements commonly referred to as slums. A significant proportion of urban populations reside in such settlements, which function as both labour reservoirs and survival economies.

These settlements are not marginal in economic terms; rather, they are deeply integrated into urban production systems. However, they remain socially and institutionally excluded from formal governance structures.

1.2 Policing Urban Slums

Policing in urban slums presents a distinct governance challenge. Unlike planned urban neighbourhoods, slums are characterised by:

- irregular spatial layouts
- high population density
- mobile migrant populations
- overlapping legal and illegal structures
- limited state visibility

Traditional policing models based on surveillance and deterrence often fail in such environments due to a lack of local trust and information asymmetry.

1.3 Problem Statement

Despite multiple reforms and community policing initiatives, policing in Indian slums continues to suffer from:

- weak legitimacy
- reactive enforcement patterns
- fragmented institutional coordination
- under-reporting of crime
- limited community participation

This necessitates a comprehensive analytical framework that integrates policing with urban governance.

1.4 Research Objectives

- To examine structural challenges of slum policing in India
- To analyse comparative policing models across four metro cities
- To evaluate international best practices
- To identify gaps in Indian policing frameworks
- To propose suitable policy recommendations

1.5 Research Questions

- What structural factors shape policing in urban slums?
- How do Indian cities manage slum policing?
- What global models provide useful lessons?
- What institutional gaps exist in current frameworks?

1.6 Significance of the Study

This study contributes to criminology, urban governance, and policing literature by:

- integrating comparative city analysis
- linking theory with empirical case studies
- incorporating global policing practices
- proposing policy-relevant frameworks

2. LITERATURE REVIEW

2.1 Indian Urban Studies Perspective

Indian scholarship on slums challenges traditional narratives of urban marginality. Scholars such as Ananya Roy (2005) and Gautam Bhan (2009) argue that slums are not deviant spaces but integral to urban economies.

Roy conceptualises slums as "urban informality regimes," where illegality and legality coexist. Bhan emphasizes that slums are politically produced rather than naturally occurring.

2.2 Crime and Slums

Reports from the National Crime Records Bureau (NCRB) suggest that crime in slums is predominantly:

- petty theft
- interpersonal violence
- domestic disputes
- informal disputes over resources

However, under-reporting remains a significant issue due to mistrust of police institutions.

2.3 Policing Literature in India

Studies by scholars such as Arvind Verma (2011) and David Bayley (1969) highlight structural limitations in Indian policing, including:

- colonial legacy structures
- hierarchical command systems
- limited community integration
- political interference

2.4 Gap in Literature

Existing research lacks:

- comparative multi-city frameworks
- integration with international policing models
- governance-policing synthesis
- longitudinal evaluation of reforms

3. THEORETICAL FRAMEWORK

The policing of urban slums in India must be understood through an interdisciplinary theoretical lens that integrates sociology, criminology, and urban governance studies. This study draws on four major theoretical traditions that collectively explain how structural inequality, institutional legitimacy, and community dynamics shape policing outcomes.

3.1 Durkheim: Social Disorganisation and Urban Cohesion

Émile Durkheim (1984) provides the foundational sociological framework for understanding crime and social order. His concept of social solidarity explains how cohesion within communities regulates behaviour through shared norms and collective consciousness.

In urban slums, rapid migration, high population turnover, and economic insecurity weaken collective norms, leading to what Durkheim describes as anomie — a condition where normative regulation breaks down. However, Indian slums often show a hybrid condition where informal norms still function, even in the absence of formal institutions.

Thus, slums are not normless spaces but reconfigured normative environments where informal social regulation replaces formal institutional control.

3.2 Wacquant: Advanced Marginality

Loïc Wacquant (2008) introduces the concept of advanced marginality, which describes urban spaces characterized by:

- spatial confinement
- economic insecurity

- institutional withdrawal
- territorial stigma

Indian slums such as Dharavi and Govandi reflect partial elements of this model but differ in one critical aspect: they are not entirely abandoned by the state. Instead, they are governed through selective intervention and fragmented authority, making them hybrid governance zones rather than fully excluded spaces.

3.3 Broken Windows Theory

Broken Windows Theory suggests that visible signs of disorder encourage further crime by signaling weak informal social control. While this theory influenced policing strategies globally, its application in Indian slums is contested.

In the Indian context, visible disorder is often structurally produced rather than behaviourally generated. Overcrowding, lack of infrastructure, and poverty create conditions that resemble disorder without necessarily indicating higher criminal intent.

Therefore, strict application of Broken Windows policing risks criminalizing poverty rather than addressing crime causation.

3.4 Procedural Justice Theory

Tom R. Tyler (2006) argues that legitimacy in policing is primarily derived from perceived fairness, transparency, and respectful treatment rather than fear of punishment.

In the urban slums, where distrust of institutions is historically embedded, procedural justice becomes the most important determinant of cooperation with law enforcement. Residents are more likely to report crime when they perceive police interactions as fair and non-discriminatory.

3.5 Integrated Theoretical Model

This study synthesizes these theories into a combined framework:

- Durkheim → explains normative breakdown and informal order
- Wacquant → explains structural exclusion and marginality
- Broken Windows → explains environmental perception of disorder
- Tyler → explains legitimacy and compliance

Together, they explain that policing effectiveness in slums is legitimacy-driven, not force-driven.

4. RESEARCH METHODOLOGY

4.1 Research Design

This study adopts a qualitative comparative research design focusing on urban policing in slums across four Indian metropolitan cities.

4.2 Data Sources

The study uses secondary data from:

- National Crime Records Bureau (NCRB)
- Bureau of Police Research and Development (BPR&D)
- Urban development reports (MoHUA)
- Peer-reviewed journals
- Policy documents
- Academic books and case studies

4.3 Case Study Approach

A multiple-case study approach is used to enable:

- cross-city comparison
- identification of patterns
- contextual interpretation of policing practices

4.4. Cities Selected

- Delhi
- Mumbai
- Kolkata
- Chennai

These cities represent diverse policing traditions, governance structures, and urbanization trajectories.

4.5 Analytical Method

Thematic analysis was used to identify recurring patterns in:

- policing strategies
- community engagement
- crime patterns
- institutional coordination

5. CASE STUDY ANALYSIS:

5.1 Delhi

Delhi Police operates in a greatly complex urban environment marked by rapid migration, dense informal settlements, and socio-economic inequality.

Delhi Police: Tactical Enforcement & Youth Divergence

Delhi's strategy balances strict law-and-order interventions in its Jhuggi Jhopri (JJ) clusters with infrastructure-based rehabilitation.

- **"Drug-Free" Target Operations:** The Delhi Police deploy multi-month tactical operations inside vulnerable settlements. For example, their Sadar Bazar slum operation utilized round-the-clock armed checkpoints, heavy street lighting, and a 12-CCTV facial recognition mesh to completely eradicate regional drug networks.
- **National Security Verification Sweeps:** Triggered by municipal directives, Delhi Police conduct aggressive, door-to-door citizenship and biometric verification drives across slums like Kalindi Kunj and Vasant Kunj to target alleged illegal undocumented settlements.
- **Education and Divergence:** To deter adolescents from street crime, the force runs the Nirbheek awareness initiative and operates public libraries equipped with Wi-Fi directly inside slums, offering standard educational resources to deter youth recidivism.

Seelampur Case

The Seelampur locality represents a critical case of youth vulnerability and gang-related dynamics. Key issues include:

- emergence of localized youth groups
- territorial disputes among informal networks
- low trust in formal policing institutions
- fear of retaliation discouraging reporting

Police interventions include:

- **YUVA (North-East District):** A Delhi Police community-policing scheme that identifies at-risk youth in the North-East district, including school dropouts, children in conflict with law, and those from families facing criminal cases and channels them into vocational skill training, self-defence, and life-skills sessions run out of local police stations, in partnership with the Ministry of Skill Development and the National Skill Development Corporation, with successful trainees connected to formal employment.
- **Aman Committee:** A standing community-liaison forum coordinated through the DCP office in Seelampur, bringing together police and local representatives for regular dialogue and coordination, including ahead of festivals and other sensitive periods, functioning as an ongoing communication channel between the force and residents.
- **Eyes and Ears Scheme:** A Delhi-wide vigilance network that draws on informal-economy stakeholders; street vendors, chowkidars, autorickshaw and taxi drivers, shopkeepers, parking attendants, to flag suspicious activity, giving police a low-cost, locally embedded information channel suited to dense informal settlements like Seelampur.
- **SPUWAC (Special Police Unit for Women and Children):** A dedicated Delhi Police unit operating across all districts, including North-East Delhi, offering counselling, mediation, and self-defence training, and coordinating with NGOs and schools on child-protection casework relevant to the youth-vulnerability dynamics described above.

However, effectiveness remains limited due to structural constraints such as unemployment and social exclusion.

Key Insight

Policing in Seelampur demonstrates that enforcement alone cannot address crime rooted in socio-economic deprivation.

5.2 Mumbai

Mumbai Police operates in one of the most complex informal urban ecosystems globally.

Mumbai Police: Community Panchayats & De-escalation

Mumbai's massive, hyper-dense slum expanses (like Dharavi or Sewri) are policed through structural decentralization and civic representation.

- **Slum Police Panchayats:** Operating in spaces like Sewri, Mumbai Police delegate low-level local law enforcement to specialized Mohalla Panchayats. Composed of neighborhood volunteers—with a mandated 30% to 35% representation of women—these groups officially manage neighborhood civil and domestic disputes.
- **New Mohalla Committees (NMCs):** Studied closely by the Tata Institute of Social Sciences (TISS), these state-recognized community platforms allow slum dwellers to bypass formal courts. NMCs have successfully reduced local crime and citizen-reported fear of crime by roughly 49%.
- **Joint Medical & Utility Rooms:** Rather than strictly using police outposts for incarceration, police outposts inside Mumbai's slums are shared with municipal doctors and utility providers, boosting local structural trust.

Dharavi Case: Informal Order and Social Regulation

Dharavi represents a high-density informal settlement with strong internal economic systems. Key features:

- strong informal economic networks
- community-based dispute resolution
- high population density
- mixed formal-informal governance

Crime patterns are largely petty and locally regulated rather than organized.

Govandi Case: Political Mediation and Informality

Govandi presents a contrasting case where political intermediaries influence local governance.

Key issues:

- informal political brokerage
- substance abuse networks
- contested land and housing rights
- overlapping authority structures

Here, policing is mediated through informal power structures, complicating direct enforcement.

Key Insight

Mumbai demonstrates that slum policing effectiveness depends heavily on informal social capital and negotiated governance systems, not just formal policing mechanisms.

5.3 Kolkata

Kolkata Police represents one of the oldest policing institutions in India, operating in a dense urban environment with long-standing slum settlements and mixed socio-economic zones.

Unlike Delhi or Mumbai, Kolkata's policing structure benefits from institutional continuity and stable neighbourhood relationships, which contribute to relatively higher familiarity between police officers and residents.

Characteristics of Slum Policing in Kolkata

The Kolkata Police rely heavily on a welfare-first model, converting active local police stations (*thanas*) into safe harbors for pavement and slum-dwelling families.

- **Project Nabadisha ("New Direction"):** This Kolkata Police initiative runs literacy and welfare centres in or around roughly 35 police stations, where around 1,600 slum-dwelling children receive free education, food, and monthly health check-ups. Kolkata's police stations double as day schools and community hubs. Slum children report to local *thanas* daily for formal education, health camps, hygiene tracking, and computer literacy.
- **Gender-Focused Skill and Safety Programmes:** The Kolkata Police Community Wing runs several distinct initiatives for women and girls: TEJASHWINI project provides short self-defence courses open to women of all ages; and SUKANYA delivers martial-arts-based self-defence training to schoolgirls.
- **KIRAN Project:** Launched in 2008, this Community Policing Wing initiative provides computer training and vocational courses (including a driving course for underprivileged women) to underprivileged youth across 20 police stations, in partnership with the West Bengal Swarojgar Corporation Ltd. Over 700 of the first 800 enrolled trainees completed certification in the programme's revived phase.
- **Neighbourhood Watch:** A citizen-police collaboration piloted in Behala, in which local youth of good standing are trained to patrol their own localities and act as an early-warning link between residents and the police station, flagging illegal or suspicious activity.
- **Damini:** A gender-focused offshoot of Project Nabadisha targeting girls aged 10–16 from vulnerable backgrounds, using football coaching to build confidence and social awareness against child marriage, trafficking, and domestic violence, with plans to expand to four zones of the city.

Key features include:

- continued engagement of officers in specific localities

- reliance on local informants and community intermediaries
- preventive policing through visibility
- informal dispute mediation at police station level

In slum clusters around areas such as Kidderpore and Tangra, policing is often preventive rather than reactive, relying on early identification of disputes before escalation.

Crime Patterns in Kolkata Slums

Crime in Kolkata slums is generally:

- low intensity
- property-related (theft, burglary)
- interpersonal disputes
- resource-sharing conflicts

Unlike Delhi or Mumbai, organized gang activity is relatively limited in most slum clusters, although informal economic tensions exist.

Key Insight

Kolkata demonstrates that institutional memory and stable police-community relationships reduce crime escalation, even in structurally deprived environments.

However, challenges remain:

- overcrowding
- limited infrastructure
- dependency on informal intermediaries

5.4 Chennai

Greater Chennai Police represents a distinct policing model that emphasizes community participation and volunteer engagement.

Friends of Police Initiative

One of the most notable innovations is the Friends of Police (FoP) programme, which integrates volunteers into policing support systems.

Key features:

- citizen volunteers assist in maintaining public order
- community awareness programs
- assistance in non-sensitive policing functions
- improved police-community communication

Perambur Case Study: Gender-Based Violence

Perambur illustrates the challenges of gender-based violence in dense slum environments.
Key issues:

- under-reporting of domestic violence
- alcohol-related household conflict
- lack of privacy due to overcrowding
- social stigma surrounding reporting

Police response includes:

- women help desks
- NGO collaboration
- counselling support systems

Key Insight

Chennai demonstrates that community volunteerism enhances policing reach, but structural social issues such as gender inequality and economic stress cannot be resolved through policing alone.

6. CROSS-CITY COMPARATIVE ANALYSIS (INDIA)

Key Comparative Findings

a) Legitimacy is Central

Across all cities, policing effectiveness depends on perceived fairness and trust.

b) Informality is Structural

Informal governance is not an anomaly but a central feature of slum life.

c) Crime is Mostly Localized

Most crimes are:

- petty
- situational
- resource-driven

d) Enforcement Alone is Insufficient

All cities show limits of coercive policing without social support systems.

Key Insight

Indian slum policing operates as a hybrid governance system, where formal police institutions coexist with:

- political intermediaries
- community leaders
- informal dispute resolution systems

This hybrid structure is both a strength (flexibility) and a weakness (lack of accountability).

7. INTERNATIONAL BEST PRACTICES IN SLUM AND INFORMAL SETTLEMENT POLICING

A comparative international lens provides critical insights into how policing in informal settlements can move beyond enforcement toward integrated urban governance and community-centred security systems.

7.1 Brazil: Favela Pacification and Territorial Policing

Brazil's approach to policing in informal settlements is best represented by the Pacifying Police Units (UPPs) in Rio de Janeiro.

Key features:

- permanent police presence inside favelas
- territorial control over gang-dominated zones
- integration of policing with social development initiatives
- initial reduction in violent crime rates

However, long-term challenges emerged:

- allegations of excessive force and militarisation
- sustainability issues due to political discontinuity
- limited structural socio-economic transformation

Key lesson: Enforcement can stabilise space temporarily, but without welfare integration, gains are not sustained.

7.2 South Africa: Community Policing Forums (CPF Model)

South African Police Service introduced Community Policing Forums (CPFs) to institutionalise citizen participation.

Core elements:

- formalised police-community dialogue structures
- shared problem identification
- participatory safety planning
- accountability mechanisms

Impact:

- improved communication in informal settlements
- enhanced legitimacy
- but limited by resource constraints and inequality

Key lesson: Institutionalised participation strengthens legitimacy but requires sustained funding and capacity support.

7.3 United Kingdom: Neighbourhood Policing Model

The UK model emphasises localised policing teams assigned to specific neighbourhoods.

Key features:

- long-term deployment of officers in defined areas
- strong visibility and accessibility
- problem-oriented policing strategies
- community reassurance functions

This model is particularly effective in deprived urban areas due to:

- continuity of contact
- trust-building
- preventive interventions

Key lesson: Stability of police presence is crucial for legitimacy in marginalised communities.

7.4 Colombia: Medellín Integrated Urban Security Model

Medellín represents one of the most successful cases of urban violence reduction through integrated governance.

Key features:

- investment in infrastructure in marginalised areas
- metro and transport connectivity
- education and social development programs
- targeted policing in high-risk zones

Crime reduction was achieved through:

- urban inclusion
- mobility integration
- reduced territorial exclusion

Key lesson: Crime prevention is fundamentally an urban development outcome, not only a policing outcome.

8. COMPARATIVE INTERNATIONAL ANALYSIS

Across global cases, three core principles emerge:

1) **Legitimacy over Force**
   All successful models emphasise trust-building over coercion.
2) **Institutionalised Community Participation**
   Participation is formal, structured, and continuous (South Africa, UK).

3) Integration of Urban Governance

Crime reduction is linked to housing, transport, and welfare systems (Colombia).

9. DISCUSSION

The comparative analysis between India and global models highlights several critical insights.

9.1 Policing as a Governance System

Urban slum policing cannot be understood purely as law enforcement. It functions as a multi-layered governance system involving:

- police institutions
- municipal agencies
- political intermediaries
- community networks
- Community policing

9.2 Role of Informal Institutions

- fill governance gaps
- resolve disputes
- mediate police-community interaction

However, they may also:

- reinforce inequality
- distort justice access
- enable political patronage networks

9.3 Structural Inequality as Core Determinant

Crime patterns are shaped by:

- poverty
- housing insecurity
- migration pressures
- unemployment

Thus, policing outcomes are structurally conditioned.

9.4 Trust and Procedural Justice

Tom R. Tyler's procedural justice theory is strongly validated across cases: fairness, respect, and transparency are more important than enforcement intensity.

10. GAP ANALYSIS

This study identifies five major gaps:

1. Lack of comparative India-wide slum policing studies
2. Integration of global best practices
3. Fragmented theoretical application
4. Governance and policing convergence models
5. Limited longitudinal evaluation of policing reforms

11. POLICY RECOMMENDATIONS

Building on the analysis of literature, comparative city practices, and the proposed framework, this section outlines a set of policy recommendations aimed at strengthening policing in urban slums in India. The recommendations are structured across institutional, operational, technological, and governance dimensions to ensure a holistic and implementable reform agenda.

11.1 Institutional Reforms in Policing Structure

A fundamental requirement for improving policing in urban slums is the institutional strengthening of community-oriented policing units. At present, community policing initiatives in many Indian cities remain fragmented, project-based, and dependent on individual officers. To address this, it is recommended that:

- Community policing units be formally institutionalized within state police structures rather than operating as ad hoc initiatives.
- Dedicated Urban Slum Policing Cells be created in metropolitan police commissionerates with specialized mandates.
- Beat policing systems be restructured to ensure smaller, clearly demarcated jurisdictions with stable postings of officers.
- Performance evaluation of police personnel should include indicators related to community engagement, trust-building, and conflict resolution, not only crime detection.

These reforms would shift policing from reactive enforcement to sustained preventive engagement.

11.2 Strengthening Community Participation Mechanisms

Effective policing in slums requires structured and continuous community participation.

While models such as Mohalla Committees (Mumbai), Friends of Police (Chennai), and beat meetings (Delhi) exist, they need greater standardization and legal backing.

Policy measures include:

- Establishing Slum Security and Safety Committees at ward or cluster levels with formal recognition under municipal governance frameworks.

- Ensuring representation of women, youth, migrant groups, and marginalized communities within these committees.
- Regular monthly meetings between police and community representatives with documented follow-up action.
- Integration of civil society organizations to facilitate mediation, awareness campaigns, and trust-building activities.

Such institutionalized participation enhances transparency and ensures that policing is responsive to local needs.

11.3 Integration of Police with Urban Governance Systems

One of the most significant gaps identified in the study is the weak coordination between policing and urban governance agencies. Slum-related issues such as housing insecurity, sanitation, substance abuse, and unemployment often spill over into policing responsibilities. To address this, the following measures are recommended:

- Creation of Inter-Agency Urban Safety Coordination Committees involving police, municipal corporations, health departments, and social welfare agencies.
- Joint planning for slum redevelopment projects to anticipate and mitigate displacement-related tensions.
- Coordinated response mechanisms for crises such as fires, floods, eviction drives, and disease outbreaks.
- Data-sharing protocols between police and urban local bodies for better situational awareness.

Such integration ensures that policing is supported by broader improvements in urban living conditions.

11.4 Capacity Building and Professional Training

Policing in urban slums requires specialized skills beyond conventional law enforcement training. It is therefore essential to invest in continuous capacity building of police personnel. Recommended measures include:

- Mandatory training modules on urban sociology, migration, and informal economies.
- Specialized training on conflict mediation, negotiation, and community engagement techniques.
- Sensitization programs on gender-based violence, child protection, and human rights law.
- Language and cultural training for officers deployed in linguistically diverse slum clusters.
- Exposure visits to successful community policing models within India and internationally.
- Specialized training programmes on urban policing operations and countering organized crime.

Such training would improve the ability of officers to engage constructively with diverse and vulnerable populations.

11.5 Technology and Data-Driven Policing

While technology has become an integral part of modern policing, its deployment in slum contexts must be inclusive and accessible. The following policy measures are recommended:

- Development of multilingual mobile-based grievance systems that allow easy reporting of crimes.
- Establishment of community digital kiosks in slum clusters for residents without smartphone access.
- Use of GIS-based mapping tools to identify crime hotspots and allocate resources effectively.
- Introduction of digital beat management systems to ensure accountability and monitoring of police activity.
- Deployment of predictive analytics for identifying patterns of recurring disputes and crime clusters.
- Use of AI-enabled surveillance and analytics platforms to support real-time incident detection, women's safety distress alerts, and predictive crime-hotspot mapping, with high-density and vulnerable localities prioritised for early coverage. Such as Pune Police's use of thermal-imaging and night-vision drones during targeted search operations in slum areas (an August 2025 exercise in the Shivajinagar and Parvati slum pockets reportedly tracked 43 known offenders in a single night).

However, technology must be used as an enabling tool rather than a replacement for human interaction, which remains central to trust-building in marginalized communities.

11.6 Focus on Vulnerable Groups

Urban slums contain populations that are particularly vulnerable to crime and exploitation, including women, children, migrants, and daily wage workers. Targeted interventions are necessary to address their specific needs.

Key recommendations include:

- Establishment of women-friendly police help desks in or near slum clusters.
- Deployment of female police officers in high-density informal settlements.
- Strengthening child protection mechanisms in coordination with education and social welfare departments.
- Special outreach programs for migrant workers to improve awareness of legal rights and reporting mechanisms.
- Anti-human trafficking and anti-drug abuse task forces with community linkages. These targeted interventions ensure that policing is inclusive and equitable.

11.7 Accountability and Transparency Mechanisms

Improving police legitimacy requires strong accountability systems. The following measures are recommended:

- Installation of complaint monitoring systems with time-bound resolution mechanisms.
- Independent oversight committees at district levels to review complaints related to slum policing.
- Regular publication of community policing performance indicators.
- Social audits involving community representatives to assess police performance in slum areas.
- Encouragement of body-worn cameras in high-conflict zones to improve transparency.

Such mechanisms enhance trust and reduce perceptions of bias or arbitrariness.

11.8 Policy Integration at State and National Levels

Finally, it is essential that urban slum policing is integrated into broader national urban policy frameworks. Recommendations include:

- Inclusion of policing components in urban development programs under ministries responsible for housing and urban affairs.
- Development of a national guideline on urban slum policing by central policing research institutions.
- Funding support for community policing innovations through centrally sponsored schemes.
- Standardized data collection on crime and policing outcomes in slum areas across cities.

This ensures consistency, scalability, and long-term sustainability of reforms.

The policy recommendations outlined above emphasize that policing in urban slums must be understood as a collaborative governance function rather than a narrow law enforcement activity. Strengthening institutional frameworks, enhancing community participation, integrating urban governance, and investing in capacity building are essential steps toward building safer, more inclusive, and more resilient urban environments.

12. CONCLUSION AND FUTURE RESEARCH DIRECTIONS

This study examined the challenges, practices, and institutional dynamics of policing urban slums in India through a qualitative research approach. Drawing on secondary literature and comparative analysis of Delhi, Mumbai, Kolkata, and Chennai, the study highlights that urban slum policing is shaped by a complex interaction of socio-economic deprivation, spatial constraints, informal governance systems, and institutional limitations within policing agencies.

A key finding of the study is that urban slums cannot be effectively understood or policed through conventional law-and-order frameworks alone. Instead, they require a broader governance approach that integrates crime prevention with social development, urban planning, and community participation. The persistence of under-reporting of crime, weak police–community trust, and fragmented governance structures indicates that policing effectiveness is closely tied to legitimacy and procedural fairness rather than coercive capacity alone.

The comparative analysis demonstrates that while each metropolitan city has developed distinct policing innovations—such as beat policing in Delhi, Mohalla Committee-based engagement in Mumbai, neighbourhood policing traditions in Kolkata, and volunteer-driven models like Friends of Police in Chennai—these initiatives remain uneven in implementation and often lack long-term institutional consolidation. This limits their scalability and sustainability.

The study also identifies that policing in urban slums is significantly influenced by informal social and political structures, which can both facilitate and complicate law enforcement efforts. In the absence of strong institutional trust, residents often rely on informal mechanisms for dispute resolution, which underscores the need for police systems to engage constructively with community networks rather than operate in isolation.

From a theoretical perspective, the findings support the relevance of social disorganization theory and procedural justice theory in explaining policing outcomes in urban slums. However, the Indian context also reveals that strong informal community networks can partially compensate for weak formal institutions, suggesting the need for more nuanced theoretical applications in future research.

12.1 Key Contributions of the Study

This research makes several contributions to the existing body of knowledge:

1. It provides a comparative qualitative analysis of policing practices across four major Indian metropolitan cities.
2. It integrates criminological theory with urban governance perspectives to interpret policing challenges in slums.
3. It identifies key structural and institutional gaps in current policing approaches.
4. It proposes a community-centred policing framework tailored to the realities of urban informal settlements in India.
5. It offers actionable policy recommendations for improving police legitimacy, accountability, and effectiveness.

12.2 Limitations of the Study

Despite its contributions, the study has certain limitations. It relies primarily on secondary sources of data, which limits the ability to capture real-time perspectives of police personnel and slum residents. The absence of primary fieldwork restricts the depth of empirical validation of observed patterns. Additionally, the study focuses on four metropolitan cities, which, while significant, may not fully represent the diversity of urban slum contexts across India.

12.3 Future Research Directions

Future research should address these limitations by incorporating primary qualitative fieldwork, including interviews with police officials, community leaders, and slum residents.

Ethnographic studies within selected slum clusters could provide deeper insights into everyday

policing practices and community interactions.

Further research is also needed on:

- The long-term effectiveness and institutional sustainability of community policing initiatives
- The role of digital policing technologies in marginalized urban settings
- Comparative studies between Indian and international slum policing models
- Gendered experiences of policing in informal settlements
- The impact of urban redevelopment and slum relocation on policing dynamics

Such studies would contribute to a more comprehensive and empirically grounded understanding of urban security governance.

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Pink Patrol and Urban Safety Governance: Evaluating Women and Children-Centric Policing in Chennai

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ABSTRACT

The qualitative study focuses on exploring the operational effectiveness, constraints, and governance dynamics of the Pink Patrol project, within the broader framework of urban policing and gender-sensitive crime prevention in the city of Chennai, India. The present study analyzes five case studies in order to evaluate how an all-women police patrol team can resolve the conflicts between fast-paced policing, community building, and good governance in urban spaces through the lens of the ongoing debates surrounding urban policing reform. As a subtheme investigation of urban policing research, the findings suggest that despite being relatively recently launched in 2019 and significantly scaled up in 2025, the Pink Patrol team demonstrates considerable operational efficiency, reflected in response times of 6-8 minutes, deterrent impact, and improved reporting. Nevertheless, serious limitations exist, including limited coverage, difficulties in collecting proof in the case of sexual harassment without contact, poor coordination between departments, and excessive emphasis on patrolling that disregards the underlying structural causes of gendered vulnerability. It can be seen from the research that effective urban policing to ensure the safety of women cannot merely be achieved by creating special patrol groups but rather demands an understanding of Crime Prevention Through Environmental Design (CPTED), urban planning theory, and organizational restructuring. Findings from this study offer empirical evidence regarding urban policing literature on gendered policing in developing nations.

Keywords: *Urban Policing, Gender-Sensitive Policing, Urban Safety Governance, Crime Prevention Through Environmental Design (CPTED), Women-Centric Policing, Chennai, India*

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INTRODUCTION

The contemporary process of urban policing takes place in an elaborate setting of demographic influence, economic disparities, and geographically specific vulnerabilities to criminal activity. Contemporary urban criminology has made clear that crime is a structural issue that is intimately associated with migration, socioeconomic hierarchy, and uneven governance of urban landscapes. In the case of Indian metropolitan cities, such issues have been compounded by fast-paced urbanization, poor infrastructural development, and patriarchal cultural traditions, which tend to expose women to crimes based on gender discrimination and sexual harassment within urban areas. Urban crime restricts mobility, hinders business activity, and creates tremendous economic losses (Sharma & Kumar, 2023). Spatial behavioral mapping carried out in the city of Delhi has found that areas where there is heavy pedestrian traffic have much higher levels of criminal activity than others. Moreover, some spatial configurations increase the likelihood of criminal behavior occurring (Gupta, 2025).

Despite the existence of multiple laws, the biggest impediment to effective deterrence lies in the poor enforcement capacity of criminal law, characterized by low conviction rates and inefficient execution (Khan, n.d.). This enforcement deficiency is particularly evident in the case of gender-specific crimes in urban public spaces. In an empirical study carried out in Delhi, sexual harassment (82%), insufficient lighting in streets (75%), unsafe transport services (68%), and the absence of security staff (64%) were cited as the major barriers to women's mobility (Gupta et al., 2025). Noteworthy is the disparity in perceptions of safety depending on the locations, where metro stations were viewed as relatively safe (72%), whereas deserted roads (29%), bus stands (48%), and parks (51%) continued to represent hazardous sites for women (Gupta et al., 2025).

One critical domain of gender-related insecurity in the context of urban policing is the public transport system. The following four main dimensions of insecurity felt by female commuters in Chennai were identified by Govindaraj et al. (2024): fear, social factors (indifference of fellow passengers and no action taken by the bus drivers), personal factors (toleration of abuse and victim blaming), and issues related to travel safety. Studies show that around 35% of women in Chennai face harassment while using public transport systems, although only 6.5% of them reported it due to stigma and distrust of institutions, among other reasons (Govindaraj et al., 2024). Sexual crimes against women are not just about direct harassment; the very fear of harassment restricts women in terms of movement, studying, and working (Borker, 2022). In an experimental study conducted on the streets of Jaipur, it was proven that an increased presence of police officers greatly reduces the incidents of street harassment (Sukhtankar et al., 2023).

Contemporary urban policing systems have slowly evolved toward adopting community policing approaches, technology integration, crime mapping, helplines, and gender-based solutions (Sharma & Kumar, 2023). Crime Prevention Through Environmental Design (CPTED) elements have increasingly been adopted within urban policing systems, demonstrating that changes to the urban environment, including better lighting, increased natural surveillance, installing security cameras, and eliminating hiding places, play a significant role in improving safety perceptions and reducing crime opportunities. The effectiveness of such environmental measures is highly

dependent on organizational culture, police accountability, and community confidence. A cross-national evaluation of successful urban safety initiatives suggests that holistic safety strategies, which include infrastructure improvements, community-oriented policing, and gender-responsive urban design, always deliver better outcomes than single-dimensional policies (Gupta et al., 2025).

To ensure an equitable and efficient response to criminal behavior in urban centers, there should be cooperation between local authorities, the police force, the citizens, and other private institutions to reach mutual agreements on long-term policy decisions. Simultaneously, the concept of feminist urban planning needs to be put forward in the discourse. This approach examines the historical legacy of the way cities were built with respect to male navigation and ensures that the concepts of security, accessibility, and mobility become inherent in urban planning. The safety of women must be perceived through both human interaction and structural efficiency (Centre for Social Research & The Asia Foundation, 2018; Centre for Social Research, 2020; Shaw, 2013).

Almost half of the population in India comprises females, but they represent only about 11 percent of the police force across the states. It is a common belief that female police personnel can deal better with cases involving sexual abuse, domestic violence, and sexual harassment since they can empathize with the victim better and have good communication skills (Mishra & Sharma, 2024). Best practices compiled by the Bureau of Police Research and Development (2021) include many urban policing initiatives from different states of India in which women and children are specifically considered. Some of these include 194 child-friendly corners in all-women police stations, 800 women help desks, 32 One Stop Centres, and Pink Patrol cars in Chennai. The Tamil Nadu Police's Kaavalan SOS mobile application can send distress signals within two to four minutes.

In August 2019, the Pink Patrol was launched by Tamil Nadu, which involved deploying 40 Amma Patrol cars to prevent crimes against women and children in Chennai. These cars patrol areas such as malls, schools, colleges, and places of worship and are equipped with a GPS tracker (Times of India, 2019). These cars are deployed in 35 all-women police stations. In November 2025, the program received a major boost when eight municipal corporations deployed 80 additional pink patrol cars worth ₹12 crore (New Indian Express, 2025). NCRB declared Greater Chennai Police among India's safest cities for women in 2023. The Greater Chennai Police consists of 103 stations, including 38 all-women police stations, with over 23,000 police personnel. The Safe City project, in 2024, deployed 45 Pink Scooters for patrolling purposes to All-Women Police Stations.

Despite much hype about novel urban policing practices, there is a clear lack of sufficient empirical assessment of the success of such practices within the context of urban policing. Without this empirical scrutiny, gender-specific policing measures are likely to become mere symbolism rather than bringing any tangible benefits. The present study offers an in-depth analysis of the Pink Patrol in Chennai in terms of urban policing and utilizes empirical information, existing literature on police reforms, principles of Crime Prevention Through Environmental Design (CPTED), feminist approaches to urban planning, and findings drawn from women's own accounts.

RESEARCH METHODOLOGY

The current study utilizes a qualitative case study methodology to examine the success of Pink Patrol critically as a police practice in urban settings such as Chennai. Qualitative methodology allows for an in-depth contextual analysis of various organizational processes, operational dynamics, and lived experience of both the beneficiaries and front-line workers in the organization. Through the case study approach, it is possible to analyze policing practices deeply within their urban setting in order to provide a meaningful interpretation of governance dynamics, implementation processes, and complex situations. (Yin, 2018). The study adopts a constructivist epistemology and recognizes that the issues of safety and policing effectiveness are socially constructed (Creswell & Poth, 2018).

The study is based on five selected cases purposely to ensure spatial diversity (busy commercial spots, groups of educational institutions, transportation centers, and residential zones), variation in types of incidents (harassment, stalking, safety problems), as well as temporal diversity (occurrence of incidents in the morning, afternoon, evening, and night-time) (Patton, 2015). The data were collected using the following methods:

1. systematic review of relevant policy documents, notifications issued by the government, and media reports (Bureau of Police Research and Development, 2021; Times of India, 2019; New Indian Express, 2025);
2. non-participant observation of the patrolling activities;
3. informal interviews with patrolling police officers, female commuters, and other members of the community;
4. spatial and contextual analysis employing CPTED theory; and
5. review of current academic literature (Govindaraj et al., 2024; Gupta, 2025)

Data analysis uses a thematic and interpretative approach (Braun & Clarke, 2006) including coding, cross-case analysis, and theoretical application using theories like the hotspot policing theory (Sherman & Weisburd, 1995), gender-aware policing principles (Centre for Social Research & The Asia Foundation, 2018), the procedural justice theory (Tyler, 2006), and feminist urbanism approaches (Centre for Social Research, 2020). The methodological weaknesses include the unavailability of zone-based crime figures, limited access to official police figures, narrow generalization of the sample population, and possible social desirability bias in conversations.

CASE STUDIES

Case Study 1: Rescue Intervention at Transport Hub

At 7:45 PM, a young woman, approximately twenty-six years old, was standing alone in a poorly lit area at one of Chennai's busiest bus stations. She had missed her scheduled bus and was in a highly crowded area with inadequate CCTV surveillance coverage. As she proceeded on foot, she felt threatened after being followed by three men toward a crowded section of the station. Recognizing the potential danger and finding no security personnel in the vicinity, she contacted the Pink Patrol hotline.

Two constables responded to the situation at the rear of the line within eight minutes in their patrol vehicle. The easily recognizable officers, owing to their pink uniforms, interposed themselves between the complainant and the men, asked them questions, documented their names and other identifiable information, and warned them against any possible legal ramifications. They escorted the lady to a well-lit location and remained until her bus arrived. Intelligence reporting was done internally by submitting a report indicating the time, location, and nature of the harassment.

Here is an example of the success of the Pink Patrol model of urban policing in action; it enables rapid responses with effective deployment procedures, it reassures the victim by having a squad composed exclusively of women, and it follows a preventive strategy rather than a punitive one, which prevents further incidents from occurring without resorting to the courts.

Case Study 2: Rescue Intervention in Educational Institution Vicinity

At 4:30 PM, a motorcyclist stalked a student in the vicinity of a women's college during dispersal hours. The incident occurred in a transition zone between the college gate and the main road, where opportunities for natural surveillance were limited. Despite attempting to seek refuge near nearby retail shops, the student continued to be followed by the stalker. Recalling the awareness campaign conducted by the Pink Patrol at her college, she promptly dialed the helpline number.

Within six minutes, the Pink Patrol arrived to monitor the school premises. Using details given by the victim, the officers traced the suspect, authenticated his identity through their mobile database system, which identified him as one of those persons against whom there were previous complaints against them in other jurisdictions, and obtained photographs and license plates from CCTV cameras installed locally. The case was then forwarded to the Women's Police Station for registration and the issuance of an FIR, which led to the arrest of the perpetrator. The patrol then worked with college authorities to put up security measures at the time of dispersing the students and trained the students on the use of the helpline and documentation of crime reports.

This example illustrates the ability to deter crimes through the consistent presence of law enforcement officers in high-crime areas, the use of community outreach to increase citizen awareness of crimes, and the use of integrated mobile databases by law enforcement officers to locate repeat offenders. The lack of detection of previous complaints made against the suspect indicates insufficient communication between the zones occupied by police units. This is a flaw inherent to the system of urban policing as a whole.

Case Study 3: Observer Perspective - Shopkeeper in Commercial Area

The owner of a store watched the Pink Patrol apprehend a man suspected of stealing a purse in a jewellery shop during an exceptionally busy night. Wireless technology was used by officers to help coordinate actions, ensuring the quick capture of the offender and retrieval of the stolen merchandise. The observer noted visible improvements in the safety climate of the

area following the arrival of Pink Patrol officers. Women shoppers in the area felt safe walking along the commercial street, even at night, while any harassment was likely to be reported with female officers present. A definite deterring influence of Pink Patrols was observed in terms of opportunistic harassment. Among other things, the patrols did not always occur on the same days of the week.

Case Study 4: Observer Perspective - Commuter at Metro Station Vicinity

Before deploying the Pink Patrol, an IT professional in her early thirties stated that she was subjected to verbal harassment, menacing stares, and harassment by the drivers, especially after dark, because it was difficult to see at night. It was a familiar location, but it had too many transition spots that made it hazardous for women to commute.

The Pink Patrols would start appearing on a somewhat regular schedule during peak hours (6:00 PM-8:30 PM). They would patrol both pedestrians and cars and even intervene in commuter interactions, distributing helpline cards and confronting drivers if needed. According to the observer, a significant increase in safety levels was observed when the Pink Patrols patrolled the location. Another noteworthy finding from this experiment was that harassment would reappear whenever the patrols did not cover their rounds. It indicates the temporary nature of the deterrent effect within the current urban policing framework.

Case Study 5: Patrol Member Perspective - Senior Constable

A senior constable with eight years of experience in policing, four years of general duty policing, and four years of Pink Patrol service, as well as postgraduate studies in criminology, provided perspectives on the matter from both practical and theoretical standpoints. The constable's main duty station involved major transport junctions and interconnecting roads. She realized that the vulnerabilities were highly variable depending on the time of the day. To be more precise, women domestic workers and early shift workers were victimized in the mornings, school and college students in the afternoons, while working professionals and informal laborers faced crime in the evenings and nights.

She also discussed structural issues in urban policing that are inherent to the process. These included the poor collaboration between the police and the transportation department, resulting in the development of unsafe infrastructure within the transportation facilities; the unclear division of patrol areas; a lack of transport for covering all the interconnected sites simultaneously; and the absence of tracking technologies for managing patrol activities and addressing complaints in real time. The indicators of success include the prosecution of offenders, the deterrence of opportunistic criminals in sites frequently visited by police patrols, and an increase in the number of reports, demonstrating that the trust of the community has been established. Her recommendation would be to include the Pink Patrol project as part of a comprehensive city-wide safety strategy, comprising CPTED-based infrastructure design, patrol stations for the transportation hubs, and improved interdepartmental training and coordination.

DISCUSSION

- **Urban Policing Effectiveness and Rapid Response**

  Pink Patrol is demonstrated to be an efficient and timely mechanism for dealing with complaints, where response time ranges from six to eight minutes. This time is significantly less compared to that required by other methods for handling complaints. These results confirm experimental findings from Delhi according to which an increase in patrolling by the police significantly reduces cases of harassment on streets and gives women a feeling of security in urban areas (Sukhtankar et al., 2023). An all-women composition of patrol groups increases their efficiency as victims may be more willing to cooperate with female police officers, as demonstrated by existing research on female policing and interaction between victims and the police (Mishra & Sharma, 2024). However, the efficiency of the operational system is conditioned by time and space. All observations confirm that there are problems related to coverage, with patrols on the ground playing a crucial role in operational influence on the population. This shows that there is a basic structural problem with the Pink Patrol urban policing model: it works well as a reactive tool, but it can't provide the constant deterrence that is needed to keep crime from happening in the first place.

- **Deterrence, Visibility, and Urban Policing Theory**

  There is a demonstrated deterrent effect, consistent with the principles of the hotspot policing theory, which posits that high police presence in high-crime areas alters the criminal opportunity structure (Sherman & Weisburd, 1995). Routine patrols ensure that opportunist criminals perceive reduced opportunities to commit offenses within commercial districts and transit points. Nevertheless, the demonstrated deterrence effect is undeniably situation-dependent and contingent upon the visibility of patrols. As evidenced by the statements of observers and patrol members, harassment practices resume where patrol visibility is low. These conclusions echo the limitations in reactive patrols globally and underscore the need for additional interventions related to the environment and structure. On the other hand, beyond its immediate deterrent effects, Pink Patrol plays an essential role as a normative and symbolic agent within urban policing, increasingly challenging traditional, gendered perceptions of law enforcement and emphasizing women's security as a legitimate institutional issue. Nevertheless, such transformations are constrained by deeply rooted cultures of victim-blaming and patriarchal structures of society.

- **Institutional Challenges and Urban Policing Resource Constraints**

  There appear to be considerable institutional constraints related to the Pink Patrol model of urban policing, as evidenced by case studies. The biggest constraint relates to the shortage of personnel in comparison with spatial requirements, and thus, the necessity to prioritize and adopt a reactive rather than proactive stance to prevent harassment. It was also difficult to collect evidence due to difficulties associated with proving sexual harassment in the form of non-contact behavior (verbal harassment, body language), and thus, a more complex

understanding of criminal law was needed to deal with such cases (Khan, n.d.). Problems with coordination among the Pink Patrol teams and the local police stations, which may cause delays that could anger citizens when reporting sexual harassment, have proven problematic in terms of governance in the urban policing context. One interesting observation made by the senior constable concerned the impact of the system - male officers advised women to report the crime to Pink Patrol rather than handling the complaints themselves.

- **CPTED, Environmental Design, and Urban Policing Interdependencies**

  One important thing learned from all the case studies is how vital interdependence exists between environmental design and the effectiveness of policing. These incidents have taken place in locations characterized by poor lighting, poor surveillance, isolation of transition areas, and no natural surveillance, all of which are considered, according to the CPTED principles, as favorable for developing structures that facilitate crimes. It can be seen that certain environmental conditions not only help in making interventions more effective but also make them less effective. For instance, proper environmental design can contribute to making patrols much more effective. Pink Patrol cannot fulfill its responsibility towards safety on its own, and the help of transportation departments, urban planners, and municipal authorities will be necessary. This learning is directly applicable to CPTED principles in the context of urban policing.

- **Feminist Urban Planning and Gender-Sensitive Urban Policing**

  These case study results correlate directly with feminist urban planning theory, where it is claimed that historically the urban environment has been developed according to the mobility needs of men, thus deliberately neglecting the safety requirements for women (Centre for Social Research, 2020). All the transition zones, dark corridors, and remote places for waiting described in the above examples illustrate the very type of problems that can be addressed with the help of feminist approaches to urban planning. Effective urban policing that is sensitive to gender issues must become an integral part of governance and urban planning policies. Cooperation between local authorities, law enforcement organizations, non-governmental organizations, and private businesses at all levels is necessary to reach a consensus on sustainable urban planning models focusing primarily on safety, accessibility, and mobility (Centre for Social Research & The Asia Foundation, 2018; Centre for Social Research, 2020; Shaw, 2013).

- **Urban Safety Governance: From Specialised Policing to Integrated Frameworks**

  Pink Patrol is a major improvement in policing urban areas in terms of ensuring the safety of women in large Indian cities. However, research findings suggest that there are many contradictions in how the initiative aligns its intentions with its practical implementation. For the initiative to have real success, many more people, technology, and funding will be required. In the absence of such factors, the initiative may remain nothing but a symbolic action aimed at addressing some urgent social problems. It appears from the cases presented that Pink

Patrol must be an integral element of larger systems designed to ensure security in the cities. Thus, effective governance should establish coordination mechanisms that integrate different stakeholders, including law enforcement agencies, municipal administrations, transport organizations, educational institutions, and women's advocacy groups. Such mechanisms should operate according to the procedures associated with the concept of procedural justice as described by Tyler (2006).

CONCLUSION

This qualitative case study evaluation of Chennai's Pink Patrol initiative, analyzed as a sub-theme within urban policing, yields contextually relevant insights into the successes and shortcomings of specialized, women-focused patrol policing in a major Indian metropolis.

Pink Patrol is really effective at what it does: it responds quickly (in six to eight minutes), has a real deterrent effect in areas with a lot of foot traffic, gets more victims to report crimes because it is made up of only women, and it has successful prosecutions. The research, however, shows that there are some basic structural problems. For example, coverage that isn't continuous makes deterrence depend on presence; barriers to collecting evidence for non-contact harassment; problems with coordination between agencies; and the risk of creating institutional silos that take the responsibility for gender-based crime away from general urban policing. The qualitative case study analysis of Chennai's Pink Patrol programme, examined in light of the sub-theme discussed under urban policing studies, provides valuable contextual insights into the strengths and weaknesses associated with such specialized forms of women-oriented patrol policing in major urban areas in India.

The most crucial contribution of the research to theories and practices of urban policing is the mutual dependency between interventions through policing and urban environmental design. The phenomenon of harassment tends to occur in those places that have poor lighting facilities, low levels of surveillance, and poor transition zones. All of these elements are considered to be major contributors to crimes according to CPTED theory. The success of Pink Patrol as a project will only be achieved when accompanied by the simultaneous urban environmental interventions based on feminist urban planning principles in managing Chennai's public space. Most importantly, in the understanding of members of Pink Patrol, the problem of harassment is inherently linked with the socio-cultural context and gender inequalities, which cannot be changed merely by means of policing intervention.

POLICY RECOMMENDATIONS

The recommendations below are provided based on the results of the research conducted in order to improve the efficiency of Pink Patrol within an integrated model of urban policing:

1. ***Improving Operations:*** Increase the number of patrol officers, establish Pink Patrol stations at key transport nodes, purchase analytical software, smartphone applications, and improved wireless communication systems.

2. ***Development and Capacity Building***: Implement specific training courses in victim support services, trauma-informed communication, and CPTED-based environmental assessments for patrol officers.
3. ***Agency Coordination:*** Establish efficient mechanisms of case transfer, interagency information sharing, and collaboration with transportation, municipal, and educational institutions.
4. ***Environmental Design Integration:*** Incorporate CPTED-based audits of urban environments and establish formal procedures for reporting environmental issues to municipal and transportation officials by the Pink Patrol.
5. ***Performance Evaluations:*** Design comprehensive evaluation methods that employ both qualitative and quantitative measures, including such metrics as victim satisfaction and reports, as well as the incidence of the problem.
6. ***Gender Mainstreaming in Law Enforcement:*** Provide the same gender-awareness training to all police officers in order not to associate gender-based crimes with certain people only.
7. ***Mobilizing the Community:*** Conduct constant awareness campaigns, develop community alliances, conduct public education to fight victim-blaming narratives, and promote the idea of calling the helpline.
8. ***Improving the Legal System and the Office of the Prosecutor:*** Ease the process of proving non-contact sexual harassment, establish fast-track prosecution, and provide comprehensive services for victims.

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Urban Public Management through Social Media Monitoring: Insights from Garuda Drishti System

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ABSTRACT

Social media has become a critical factor in urban environments, enabling both civic engagement and the rapid spread of misinformation, radicalisation, and coordinated criminal activity. In densely populated cities, online content can quickly translate into real-world consequences such as public disorder, flash protests, and communal tensions. An analysis of trends in Maharashtra (2022–2025) indicates a rising trajectory of social media–enabled offences, characterised by platform migration and increased use of encrypted applications, posing significant challenges for urban law enforcement in terms of anonymity, attribution, and cross-jurisdictional data volatility.

This study examines the integration of Social Media Intelligence (SOCMINT) and Open-Source Intelligence (OSINT) into urban policing, supported by advanced AI techniques such as Natural Language Processing and Graph Neural Networks. It presents Garuda Drishti, an AI-driven system developed by the Nagpur City Police, which integrates real-time multimodal analysis, geospatial intelligence, and automated reporting to support preventive policing and public order management.

Ultimately, the study concludes that the future of effective cybercrime control and urban public order management lies in institutionalising technologically advanced, ethically governed, and legally robust social media intelligence ecosystems. These systems, supported by specialised training, inter-agency coordination, and continuous technological adaptation, can significantly strengthen preventive urban policing, improve situational awareness, and enable law enforcement agencies to respond proactively to emerging digital threats while maintaining constitutional safeguards and public trust.

Keywords: *Urban Policing, Social Media Intelligence (SOCMINT), Public Order Management, Social Media–Enabled Crime, Artificial Intelligence in Policing, Geospatial Intelligence, Predictive Policing, Garuda Drishti*

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INTRODUCTION

The exponential growth of social media platforms has significantly reshaped communication, political discourse, and social mobilisation, particularly within urban environments characterised by high population density and rapid information exchange. While these platforms serve as powerful tools for expression, networking, and civic engagement, they have simultaneously emerged as critical enablers of urban crime and public order–related challenges. In cities, social media functions not merely as a medium of interaction but as a dynamic operational space where criminal intent, ideological mobilisation, and unlawful activities are planned, coordinated, and executed, often translating swiftly into on-ground situations. Consequently, social media–enabled crimes present complex challenges to urban law enforcement due to their speed, anonymity, scale, and potential for immediate offline spillover affecting public order.

Social media–enabled crimes encompass a broad spectrum, including cyber fraud, impersonation, identity theft, cyber stalking, online harassment, sexual exploitation, hate speech, misinformation, radicalisation, extortion, and organised criminal networking. In urban contexts, these offences frequently act as catalysts for physical-world consequences such as mobilisation of unlawful assemblies, flash protests, incitement to violence, traffic disruptions, and disturbances to civic life. The close linkage between online narratives and real-world outcomes in cities necessitates a comprehensive, intelligence-led urban policing approach that integrates cybercrime investigation with public order management, crowd control, and preventive security.

In response to these evolving urban challenges, law enforcement agencies worldwide have adopted Social Media Intelligence (SOCMINT) as a critical component of modern urban policing[1]. SOCMINT involves systematic collection, analysis, and interpretation of publicly available social media data to generate actionable intelligence for crime prevention, investigation, and maintenance of public order. In the Indian context, such intelligence gathering must operate within constitutional safeguards, statutory provisions, and judicial oversight to ensure the protection of fundamental rights, particularly freedom of speech and privacy[2].

Within this framework, the Nagpur City Police developed *Garuda Drishti*, an indigenous social media monitoring and analytics tool designed to support proactive, preventive, and intelligence-driven urban policing. Garuda Drishti enables structured monitoring of open-source social media platforms to identify unlawful content, emerging threats, and behavioural patterns indicative of criminal or disruptive activities in urban settings. The tool facilitates the analysis of social media intelligence related to political mobilisation, coordinated campaigns, and potential public order sensitivities, while ensuring neutrality and legal compliance.

Additionally, Garuda Drishti plays a critical role in identifying linkages between online communications and offline urban incidents, such as planning of crimes, mobilisation of groups, circulation of sensitive content, and dissemination of logistical information. The tool also supports early detection and real-time monitoring of protests, demonstrations, and mass gatherings in cities, enabling authorities to assess sentiment, anticipate escalation, plan traffic and crowd management measures, deploy resources efficiently, and ensure lawful conduct of assemblies.

Further, Garuda Drishti contributes significantly to preventive security and VIP protection in urban areas by providing advance intelligence related to visits and events, including online threat perceptions, hostile narratives, misinformation campaigns, and mobilisation calls that may pose security risks. Such intelligence enhances situational awareness and supports informed decision-making for urban security planning and risk mitigation.

This paper critically examines the typology of social media–enabled crimes within urban contexts, the role of social media as both a crime facilitator and an intelligence source, and the integration of SOCMINT into contemporary urban policing. It presents Garuda Drishti as a case study in technology-assisted law enforcement, analysing its intelligence capabilities, operational use cases, legal and ethical considerations, and impact on crime detection, public order management, and preventive security in Nagpur City. Through this analysis, the paper highlights how the responsible use of social media intelligence tools can strengthen urban policing while upholding democratic values and constitutional protections in the digital era.

Social Media-Enabled Crimes

With the advent of social media, criminals can commit crimes across various legal jurisdictions against large numbers of people. Although social media provides a platform for new forms of crime, these novel crimes have a common modus operandi. Figure 1 displays a classification of social media-enabled crimes.



Fig 1: ***Types of Social Media-Enabled Crimes.***

Trends of Social Media-Enabled Crimes in Maharashtra [3]

I. Overall Registration Trend (2022–2025)

An analysis of the social media-related crime (FIRs registered) data from 2022 to 2025, in Maharashtra, shows a sharp decline in total registered cases in 2023 compared to 2022, followed by a strong surge in 2024, and a slight moderation in 2025, while still remaining significantly higher than 2023 levels. This indicates that social media–related cyber offences are not declining structurally but are instead showing a long-term upward trajectory, particularly after 2023. The dip in 2023 may be attributed to reporting variations, reclassification of offences, or temporary enforcement changes. However, the steep rise in 2024 suggests growing digital penetration and misuse of social media platforms. Administratively, this

trend calls for strengthened monitoring mechanisms, improved investigative capacity, and proactive preventive awareness initiatives. Figure 2 demonstrates year-wise trends of social media-related offences, detected offences, and accused arrested in those crimes.

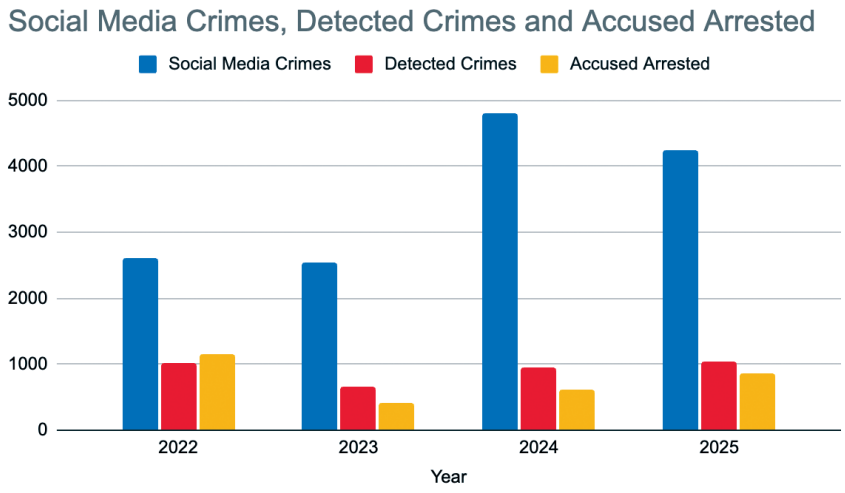


Fig 2*: Trends of registered, detected, and accused arrested in social media-related crimes in Maharashtra[4].*

II. Platform-Wise Trends

Instagram – The Fastest Growing Threat

The data clearly indicates that Instagram has emerged as the leading platform for social media-related cybercrime, with registrations rising consistently each year from 2022 through 2025. Unlike other platforms, Instagram shows a continuous year-on-year increase, making it the largest contributor to total cases. This growth pattern suggests increasing misuse of the platform for offences such as fake profiles, sextortion, impersonation, investment scams, and influencer frauds. Given this consistent upward trend, there is a strong need for a dedicated Instagram-focused monitoring and liaison mechanism, along with targeted youth awareness campaigns.

Facebook – Declining but Still Significant

Facebook-related cases show a decline in 2023 as compared to 2022, followed by a moderate rebound in 2024 and relative stabilization in 2025. While Facebook remains a significant contributor to overall cybercrime, the data suggests a shift in offender preference from Facebook to Instagram. This may reflect demographic changes in user engagement, with younger users gravitating towards Instagram. While Facebook should continue to be monitored, resource allocation may need to prioritize platforms showing sharper growth.

Email – Fluctuating but Operationally Sensitive

Email-related offences display a fluctuating trend, with a noticeable rise again in 2025. Although the volume is lower than on Instagram and Facebook, email crimes often involve business email

compromise (BEC), financial fraud, and corporate scams, making them operationally significant. The increase in 2025 may indicate a resurgence in targeted financial and institutional frauds. This underscores the need for corporate awareness drives and focused coordination with financial institutions.

Snapchat – Low Volume but Persistent

Snapchat-related cases remain comparatively low but show a persistent presence. Given its youth-centric user base, offences on this platform may involve cyberbullying, exploitation, and social manipulation crimes. Even though the numerical impact is smaller, preventive measures in educational institutions and youth engagement programs remain essential.

Figure 3 displays year-wise trends of cybercrimes committed on various social media platforms in Maharashtra. It is clearly seen that the ratio of cybercrimes on end-to-end encrypted platforms like WhatsApp and Telegram has increased substantially from 2022 to 2025. The use of WhatsApp in cyber frauds increased from 44 percent in 2022 to 54 percent in 2025. Similarly, the use of Telegram in cyber frauds increased from 1.6 per cent in 2022 to 11.8 per cent in 2025.

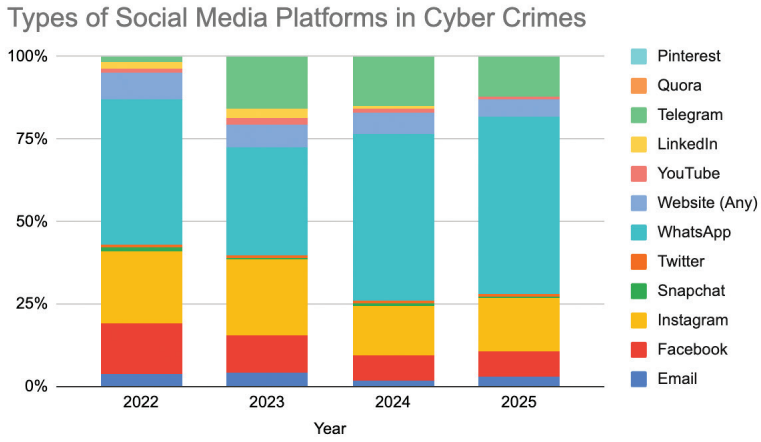


Fig 3: ***Year-wise trends of platforms used in Cyber Crimes in Maharashtra[5].***

III. Detection Rate Trends

A key concern emerging from the data is that detection rates are not increasing proportionately with the rise in registered cases, particularly on high-volume platforms like Instagram. While registrations are steadily increasing, detection numbers have not shown equivalent growth. This gap suggests that investigative capacity may not be scaling in line with caseload expansion. Strengthening digital forensic infrastructure, improving data-sharing timelines with platforms, and integrating AI-based case prioritization tools could improve detection efficiency.

IV. Arrest Trends

The data indicates that arrests are not proportionate to the number of registered cases, especially during peak registration years. This disparity may stem from challenges such as cross-border

offenders, fake digital identities, mule accounts, delays in platform data access, and jurisdictional complexities. The widening gap between registration and arrest figures suggests the need for stronger inter-state and international coordination, faster digital evidence acquisition, and specialized cyber investigation training.

V. Structural Observations and Strategic Implications

A clear structural pattern is visible in the shift of cybercrime activity from Facebook to Instagram, reflecting changing user demographics and offender strategies. Additionally, the increasing prominence of youth-dominated platforms signals a need for targeted preventive interventions. The overall rise in social media-related offences, combined with relatively flat arrest rates, highlights systemic challenges in enforcement capacity.

To address these issues effectively, there is a need to establish platform-specific cyber monitoring units, strengthen liaison mechanisms with social media companies, enhance digital forensic staffing, and implement quarterly data-driven review dashboards at the supervisory level. A proactive approach combining enforcement, technology adoption, and preventive awareness will be essential to counter the evolving landscape of social media cybercrime.

Artificial Intelligence and Machine Learning for Social Media Monitoring

As of 2023, social media platforms collectively accounted for approximately 4.95 billion users worldwide [6]. The interactions generated by this vast user base produce enormous volumes of digital data, making social media a critical source of electronic evidence for monitoring and investigative purposes.

Artificial intelligence techniques, particularly natural language processing and deep learning models, offer significant potential to strengthen social media monitoring by reducing manual investigative effort, identifying hidden correlations, and generating meaningful intelligence from the vast and heterogeneous data produced on online platforms. The evidentiary value of social media is derived from multiple categories of digital data, each offering distinct analytical insights[7]:

(a) **Text-based material**: Written communications such as posts, replies, direct messages, and comments can reflect user intent, behavioural patterns, and indicators of unlawful activity, including harassment, cyberbullying, or the propagation of hate speech.

(b) **Visual and audio content**: Photographs, video footage, and audio clips shared on social platforms often capture critical details related to people, places, timelines, and actions that may be relevant to an investigation.

(c) **Relational and interaction data**: Examination of online relationships—such as follower networks, group memberships, and communication patterns—can assist in identifying organised groups, coordinated behaviour, or concealed linkages between individuals.

(d) **Contextual metadata**: Supplementary information embedded within social media content, including timestamps, geolocation markers, and device-related data, provides essential contextual and forensic indicators that help establish chronology and authenticity.

Core Objectives of Social Media Monitoring

The primary aim of social media forensics lies in the systematic use of digital evidence generated on online platforms to achieve several investigative and analytical outcomes:

(a) **Reconstruction of events**: Through detailed examination of user-generated content and interaction patterns, investigators are able to rebuild chronological sequences, identify relevant actors, and interpret the surrounding circumstances of particular incidents. This approach is especially valuable in criminal inquiries and in studying the dissemination of misinformation.

(b) **Detection of unlawful conduct**: Social networking platforms may be misused for activities such as cyber harassment, hate-driven expression, online intimidation, and financial deception. Forensic analysis helps uncover digital traces of such conduct, thereby supporting prosecution and reinforcing accountability mechanisms.

(c) **Network and Influence Mapping**: Mapping digital relationships and communication flows allows investigators to detect structured groups and concealed linkages. This capability is critical when examining organised crime, extremist networks, or coordinated illicit operations, and contributes directly to preventive law enforcement efforts.

(d) **Assessment of collective sentiment and discourse**: The large-scale analysis of social media content enables the extraction of trends in public opinion and emotional responses across issues of social relevance. Such insights assist policymakers, researchers, and institutions in understanding societal dynamics and formulating evidence-based strategies.

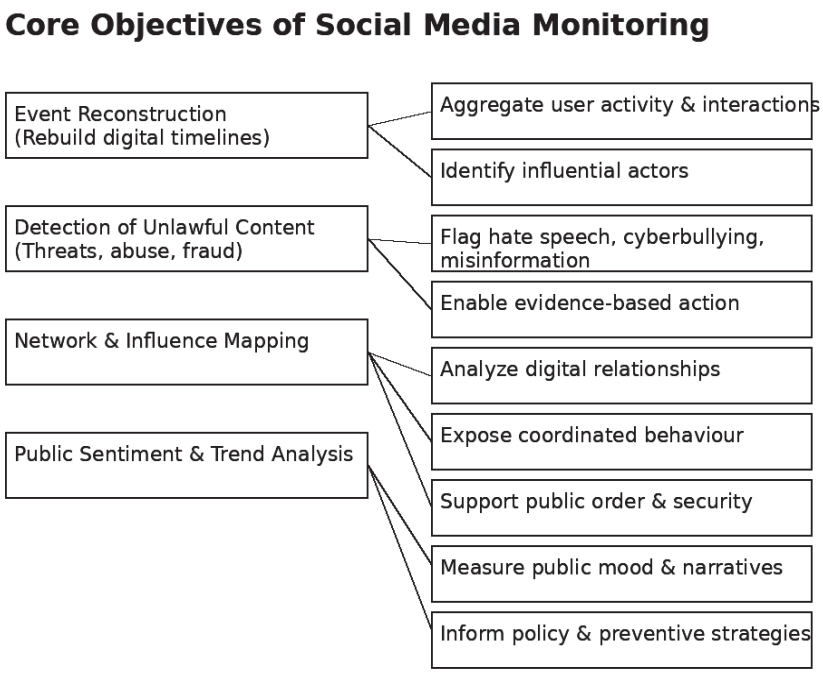


Fig 4: ***Core Objectives of Social Media Monitoring.***

OSINT in Social Media Monitoring

Open-source intelligence (OSINT) refers to the systematic collection and interpretation of information that is lawfully available in the public domain, including content from social networking platforms, online forums, blogs, and similar digital spaces. This process relies on openly accessible tools and techniques to extract and evaluate publicly visible material such as posts, comments, discussions, engagement metrics, metadata, and multimedia content, including images and videos. Within the sphere of social media monitoring, OSINT plays a critical role by enabling investigators to examine publicly shared digital traces without the need for intrusive or covert data collection methods.

A range of OSINT techniques are commonly employed in social media monitoring, including the following:

(a) Profile analysis: Reviewing publicly available profile details—such as biographical information, posted content, interaction history, and follower or friend lists—can provide insights into an individual's interests, affiliations, and online behaviour.

(b) Keyword and hashtag tracking: Targeted searches using relevant terms or hashtags enable investigators to locate conversations, media content, and thematic discussions linked to specific events or activities.

(c) Geospatial assessment: Location-related metadata embedded within posts or media files can help associate users or content with particular geographic areas, offering valuable contextual information for investigations.

(d) Social network mapping: Examining patterns of interaction and connectivity between accounts allows analysts to uncover relational structures, influence networks, and possible coordination among users. Together, these techniques enable forensic practitioners to methodically collect and interpret digital footprints left on social media platforms. By doing so, investigators can reconstruct sequences of events, infer possible motivations, and develop a clearer picture of online conduct.

NLP in Social Media Monitoring

Natural Language Processing (NLP) is a specialised branch of artificial intelligence that focuses on enabling computational systems to understand, analyse, and generate human language in a manner that is both contextually relevant and operationally useful [8]. To achieve this, NLP relies on a sequence of linguistic and statistical techniques. These include text pre-processing methods such as noise removal, error correction, and tokenisation, which convert raw text into structured units suitable for analysis. Grammatical analysis is performed through part-of-speech tagging, allowing systems to determine the functional role of words within sentences and thereby improve syntactic understanding. Named-entity recognition is used to identify and classify references to entities such as individuals, institutions, and geographic locations, linking textual mentions to real-world entities. Sentiment analysis evaluates the emotional orientation of content, helping to infer opinions, attitudes, or indicators of hostility. In addition, topic modelling techniques are applied to large collections of text to identify dominant themes and latent discussion patterns.

Within the social media ecosystem, text-based content constitutes the largest share of user activity, appearing in the form of posts, comments, private messages, and discussions. Extracting meaningful insights from this unstructured and continuously expanding textual data is a central challenge in social media monitoring. NLP addresses this challenge by providing automated tools capable of processing language at scale, thereby enabling investigators and analysts to interpret discourse, detect trends, and assess risks efficiently.

NLP for Radicalisation Detection

Digital forensic practitioners increasingly rely on natural language processing (NLP) as an analytical instrument to detect and assess radicalisation-related discourse on social media platforms. NLP-based approaches enable systematic examination of textual content to identify linguistic signals, narrative structures, and behavioural markers commonly associated with extremist ideologies [9].

Research in this area typically applies a multi-stage analytical pipeline [10]. Initial stages involve text normalisation and feature extraction, where raw online content is refined and transformed into measurable attributes such as lexical patterns, emotional polarity, and usage frequency. Semantic representation techniques [11], including word embedding models like Word2Vec, are then employed to encode contextual relationships between words, allowing systems to recognise conceptually similar expressions that may signal extremist messaging. These representations are subsequently processed using machine learning classifiers, which evaluate the likelihood that a given text reflects radical or extremist intent based on learned patterns.

NLP for Cyberbullying Detection

In cyberbullying, perpetrators frequently conceal their identities by using fake profiles, disposable email accounts, anonymisation tools, or aliases, making detection and accountability more challenging. As a result, the automated identification of harmful online behaviour—including cyberbullying, hate speech, toxicity, and abusive language—has become a major area of focus within natural language processing (NLP) research.

Contemporary approaches to cyberbullying detection increasingly rely on machine learning and NLP techniques to analyse linguistic patterns and contextual cues within online text. Manogaran et al. (2021) [12] proposed an NLP-driven detection framework that combines word similarity measures with rapid text identification using deep structured learning models. In another study, Ahmed et al. (2021) [13] developed a multilingual cyberbullying detection system for Bangla and Romanised Bangla by applying NLP techniques and multiple machine learning classifiers to YouTube comment datasets. Further, Elsafoury et al. (2022) [14] performed a comparative evaluation of word embedding models trained on social media and non-social media corpora, assessing their effectiveness in tasks such as social bias measurement and cyberbullying detection.

GNN for Social Media Monitoring

Graph Neural Networks (GNNs) have gained significant attention in recent years for applications that involve highly interconnected data, including the analysis of social media ecosystems. These models are designed to operate directly on graph-based representations, which naturally mirror the relational structure of social platforms where users, content, and interactions are tightly

linked[15]. Unlike conventional neural networks that require inputs of fixed size and structure, GNNs are capable of learning from graphs of varying shapes and complexities by explicitly modeling relationships among entities.

A defining mechanism within GNN architectures is the iterative exchange of information between connected nodes, commonly referred to as message passing. Through this process, each node progressively refines its representation by aggregating features from its neighbors, allowing the model to capture both local and global structural characteristics of the network[16].

This relational learning capability enables GNNs to perform essential analytical tasks such as classifying users or content, predicting links between entities, and assessing entire subgraphs—functions that are central to effective social media monitoring [17].

GNNs allow investigators and analysts to model complex interaction patterns involving users, posts, comments, and communities in a unified framework. By exploiting these relational dependencies, GNN-based systems can identify abnormal behaviour, trace coordinated activity, and detect harmful phenomena such as the spread of fake accounts, cyberbullying networks, or online radicalization efforts. Furthermore, GNNs are well-suited to large-scale and evolving environments, as they can adapt to dynamic network changes and remain robust in the presence of noisy or incomplete data.

Use of GNN in Online Criminal Activity

Graph Neural Networks (GNNs) have emerged as an effective analytical approach for identifying a wide spectrum of unlawful and malicious behaviour on social media platforms, including activities such as online drug trafficking and coordinated trolling. Because social media environments are inherently relational, they can be naturally modelled as graphs in which users, posts, and digital entities form nodes, while interactions, communications, and associations are represented as edges. This graph-based abstraction enables forensic analysts to capture complex interdependencies and behavioural patterns that are often invisible to traditional, feature-based analysis methods.

Recent research has demonstrated the practical value of GNNs in uncovering illicit online networks. Qian et al. (2021)[18] introduced a detection framework known as MetaHG for identifying drug trafficking activity on Instagram. Their approach constructs a heterogeneous graph to reflect the multifaceted relationships among users, content, and transactional indicators involved in online drug distribution.

Beyond drug trafficking detection, GNN-based models have also been applied to identify coordinated troll networks and the dissemination of harmful or abusive content on social media platforms [19]. By using graph convolutional neural networks to analyse interaction patterns, message propagation, and user behaviour, researchers can detect organised and manipulative activity that may otherwise appear benign when examined in isolation.

Garuda Drishti: An Integrated Social Media Intelligence Framework for Public Order Management and Urban Policing

The exponential growth of social media platforms has fundamentally transformed the information ecosystem, particularly within urban environments marked by dense populations and rapid

information exchange. While enabling democratic expression, these platforms have also created complex challenges related to misinformation, hate speech, radicalisation, organised crime coordination, and threats to public order in cities. Urban law enforcement agencies are increasingly required to monitor and respond to such online triggers in near real time, as digital narratives often translate quickly into on-ground situations such as protests, unrest, and disruptions to civic life, necessitating automated, scalable, and legally compliant intelligence systems.

This paper presents *Garuda Drishti*, an advanced Social Media Threat Intelligence and Reporting System conceptualised and developed during CyberHack Event 2025 under the aegis of Nagpur City Police. The system integrates machine learning, multimodal content analysis, automated reporting workflows, and geospatial intelligence to support preventive urban policing, intelligence-led operations, and lawful digital surveillance. It demonstrates how artificial intelligence can be operationalised within Indian legal frameworks, particularly the Bharatiya Nyaya Sanhita, 2023 and the Information Technology Act, 2000, to enhance public safety, strengthen public order management, and ensure accountability with due procedural safeguards.

Garuda Drishti is conceived as a next-generation social media intelligence platform designed to detect, analyse, classify, and report harmful online content across major digital platforms such as X (formerly Twitter), Facebook, and Instagram, with specific relevance to urban policing requirements. It adopts a proactive and automated intelligence-driven approach aligned with modern urban policing doctrines, including preventive policing, predictive threat assessment, and evidence-based decision-making for city-level law enforcement.

By integrating text analytics, computer vision, optical character recognition, and geospatial mapping, Garuda Drishti enables law enforcement agencies to identify early indicators of urban unrest, communal tension, violent mobilisation, and coordinated criminal activities. It also supports real-time monitoring of potential flashpoints such as protests, gatherings, and traffic disruptions in urban areas.

The system represents a shift from reactive cyber policing to continuous urban situational awareness, wherein online signals are systematically monitored, analysed, and correlated to generate early warnings for timely intervention. Such capabilities are critical for maintaining public order, enhancing preparedness, and strengthening urban policing responses in an increasingly digital and interconnected environment.

Key Features of Garuda Drishti

1. Keyword-Based Search and Monitoring

Garuda Drishti enables real-time monitoring of predefined keywords and hashtags associated with urban crime, terrorism, violence, public disorder, and other city-level security concerns. The system continuously scans major social media platforms, including Meta (Facebook and Instagram), YouTube, and X (formerly Twitter), allowing urban law enforcement agencies to proactively detect emerging threats, behavioural trends, and coordinated activities that may escalate into protests, unrest, or disruptions to public order in densely populated areas.

2. AI-Enabled Image Processing for Detection of Toxic and Unlawful Visual Content

Within the Garuda Drishti social media intelligence framework, advanced image-processing capabilities are deployed to identify toxic, harmful, or unlawful visual content circulating across open-source platforms in urban contexts. Social media–enabled crimes in cities increasingly exploit images containing hate symbols, extremist insignia, weapon displays, morphed or obscene material, and misleading visual propaganda intended to incite violence, communal disharmony, or disturbances to public order. Garuda Drishti applies artificial intelligence–based computer vision models for object detection, scene recognition, optical character recognition (OCR), and symbol classification, enabling automated screening of images even in the absence of textual captions. Techniques such as perceptual hashing and image-similarity matching further enable the system to identify previously flagged harmful visuals that reappear in altered forms (cropped, filtered, mirrored, or meme-adapted), thereby supporting the tracking of propagation patterns and coordinated dissemination networks within urban environments.

3. AI-Based Video Processing and Multimodal Toxic Content Analysis

Garuda Drishti incorporates AI-driven video processing and multimodal analytics to detect toxic or unlawful audiovisual content within urban contexts. The system performs automated frame extraction, activity recognition, audio transcription, and speech-to-text conversion to identify violent acts, hate speech, mobilisation calls, or extremist narratives embedded in video posts that may lead to public disorder in cities. Deep-learning models within Garuda Drishti can recognise scenes involving physical aggression, weapon handling, arson, vandalism, or unlawful assemblies, while audio analysis enables identification of inflammatory slogans, threats, or coordinated incitement delivered through speech or chants. By correlating visual frames, spoken language, and metadata, including timestamps, user associations, and geospatial indicators, the system generates actionable intelligence on the origin, context, and spread of harmful video content. This multimodal capability is particularly valuable for monitoring live-streamed urban events, viral misinformation videos, and propaganda clips that may trigger unrest or disrupt civic life, thereby enhancing proactive urban policing, situational awareness, and digital evidence generation.

4. Automated Intelligence Generation

Garuda Drishti leverages automation and AI to classify social media content into critical intelligence categories relevant to urban policing, including political sensitivity, religious sentiments, criminal activity, VIP security concerns, and risks to public order and civic safety. Based on this analysis, the system generates daily intelligence reports, which are disseminated to concerned police stations, cyber units, and urban intelligence wings to facilitate timely preventive measures, targeted deployment, and effective law enforcement response.

5. Content Takedown Coordination and Legal Compliance

Garuda Drishti facilitates coordinated action for content takedown in accordance with statutory provisions, particularly in matters affecting urban public order and security. It enables engagement with social media intermediaries under Section 79 of the Information Technology Act, 2000, for the removal of unlawful content, and with the State Intelligence

Department under Section 69 of the IT Act in cases involving urban security concerns and lawful interception. The system also maintains official audit trails and logs of actions taken, ensuring transparency, accountability, and legal compliance within urban policing operations.

System Architecture Overview

Garuda Drishti adopts a modular, layered architecture grounded in contemporary distributed system design principles. The architecture emphasises separation of concerns, scalability, security-by-design, and operational resilience. Each component functions independently yet integrates seamlessly through well-defined interfaces.

The frontend layer provides a web-based analytical dashboard enabling users to configure monitoring parameters, visualise intelligence outputs, and initiate response actions. The backend API server acts as the orchestration layer, managing data ingestion, machine learning workflows, and system logic. The data storage layer employs cloud-based NoSQL architecture to ensure flexibility, redundancy, and rapid access. Supporting modules include automated scraping engines, machine learning pipelines, reporting automation, and geolocation services.

Core System Components and Functional Analysis

1. **Data Collection and Scraping Infrastructure**

   Garuda Drishti employs advanced scraping mechanisms powered by Apify and RapidAPI actors to collect publicly accessible content from multiple social media platforms. These mechanisms support keyword-based monitoring, hashtag tracking, user account surveillance, and geographic filtering. Rate-limiting compliance and ethical data collection practices are embedded into the scraping logic to ensure adherence to platform policies.

2. **Multimodal Harmful Content Detection**

   The machine learning pipeline constitutes the analytical core of the system. Textual data undergoes toxicity and sentiment analysis using transformer-based models such as Toxic-BERT. Visual content is analysed using YOLOv8 for object detection, NSFW classifiers for explicit material, and OCR engines for extracting embedded text from images and videos. These independent analytical streams are synthesised into a unified severity scoring mechanism that categorises content based on risk thresholds.

3. **Intelligence Visualisation and Analyst Interface**

   Garuda Drishti presents intelligence outputs through interactive dashboards incorporating temporal trends, severity-based filters, and geospatial heatmaps. These visualisations enable analysts to identify emerging hotspots, coordinated campaigns, and temporal escalation patterns, thereby supporting rapid situational assessment.

4. **Operational Workflows and Automated Reporting**

   The end-to-end operational workflow begins with analyst-defined monitoring parameters, followed by continuous data ingestion, machine learning-based analysis, and secure data storage. Flagged content is reviewed by trained analysts who may initiate further investigation or trigger automated reporting mechanisms.

CONCLUSION

The rapid proliferation of social media platforms has fundamentally altered the landscape of urban crime, public communication, and law enforcement response. This study demonstrates that social media–enabled offences in Maharashtra exhibit a consistent upward trajectory, accompanied by increasing complexity in terms of anonymity, encrypted communication, cross-platform migration, and the rapid dissemination of harmful content in densely populated urban settings. Traditional investigative approaches alone are insufficient to address these challenges, particularly where online narratives quickly translate into on-ground incidents such as unrest, protests, and disruptions to public order, thereby necessitating the integration of Social Media Intelligence (SOCMINT), Open-Source Intelligence (OSINT), and artificial intelligence–driven analytical frameworks within modern urban policing systems.

The research highlights how advanced technologies such as Natural Language Processing, graph-based network analysis, and multimedia content detection can enhance the capacity of urban law enforcement agencies to identify coordinated digital threats, misinformation campaigns, and social media–driven activities that may impact public order at scale. The proposed Garud Drishti framework illustrates a practical implementation of such an intelligence-driven system by integrating real-time data collection, automated analysis, geospatial mapping, and structured reporting mechanisms within a legally compliant architecture aligned with the Information Technology Act, 2000, and the Bharatiya Nyaya Sanhita, 2023.

Ultimately, the findings establish that modern urban policing and cybercrime mitigation require a systematic shift toward technologically mature, ethically anchored social media intelligence frameworks. The study underscores that continuous technological adaptation, coupled with specialized training and seamless inter-agency networks, changes policing from a reactive force to a proactive shield.

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Urban Crime Control & Predictive Policing In Cities

Rajesh Kumar Srivastava, IPS*



ABSTRACT

The paper evaluates how the rapid urbanization in the country has led to evolving crime complexities, which demand a transition from reactive to proactive, data-driven policing. It highlights predictive policing as a transformative framework for crime prevention and resource optimization. By leveraging geospatial analytics, data mining, and machine learning, law enforcement can anticipate where, when, and under what conditions crimes are likely to occur. Benchmarked against both international frameworks and Indian case studies such as CMAPS and CCTNS, this research paper analyzes the current scalability of predictive analytics in India. The study also explores the integration of AI, drones, and cyber analytics for critically assessing operational challenges regarding algorithmic bias, privacy, and infrastructure. The paper highlights that maximizing public safety requires implementing these technologies within a strict ethical and legal framework. It concludes by recommending standardized data governance, human-in-the-loop oversight, and enhanced community engagement as vital prerequisites for responsible implementation.

Keywords: *Policing, Urbanization, Law Enforcement, AI, Technology, Drones, CMAPS, CCTNS, Delhi*

EXECUTIVE SUMMARY

Rapid urbanization in India has led to a surge in nuanced and congested criminal activity, necessitating a shift from reactive to initiative-taking policing. Traditional methods often rely on anecdotal evidence, leading to uneven resource allocation. This report outlines how predictive policing — the application of analytical techniques to identify targets for police intervention — can be leveraged in the Indian context. By synthesizing data from global case studies, specific Indian initiatives (such as Delhi's CMAPS and Hyderabad's surveillance grid), and machine learning research, this report demonstrates that predictive policing can significantly enhance crime prevention. Specifically, Random Forest algorithms applied to Indian crime data have demonstrated prediction accuracy (R^2 score) of 92.7%, suggesting a viable path forward for Indian law enforcement agencies (LEAs).

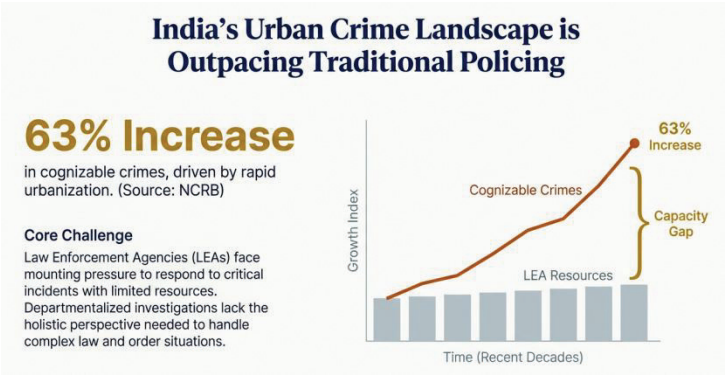
* Superintendent of Police, ANTF, DGP Headquarters, Lucknow



1. INTRODUCTION: THE PARADIGM SHIFT TO INITIATIVE-TAKING POLICING

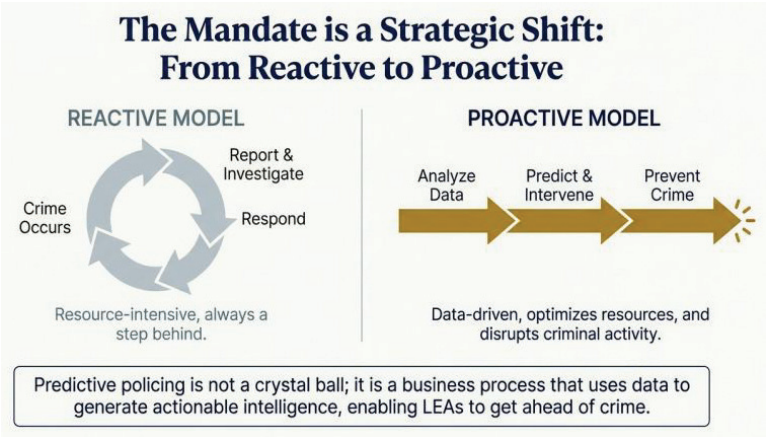
1.1 The Need for Predictive Policing in India

The economic benefit of effective policing, to prevent crime, is obvious. But so are the broader benefits to a nation. The vulnerable are protected, citizens are more productive, and businesses are more likely to invest where they feel secure. Indian Police forces are constantly under pressure to respond swiftly to critical incidents while working with limited resources. According to the National Crime Records Bureau, cognizable crimes have witnessed the largest increase of approximately 63%. Departmentalized investigations cannot provide a holistic picture to aid law enforcement agencies. To counter and to effectively manage the critical law and order situations, a holistic analysis of different facets of the information is necessary. Predictive policing offers a solution by harnessing geospatial technologies, big data analytics, and evidence-based response models to forecast where and when crime is likely to occur.



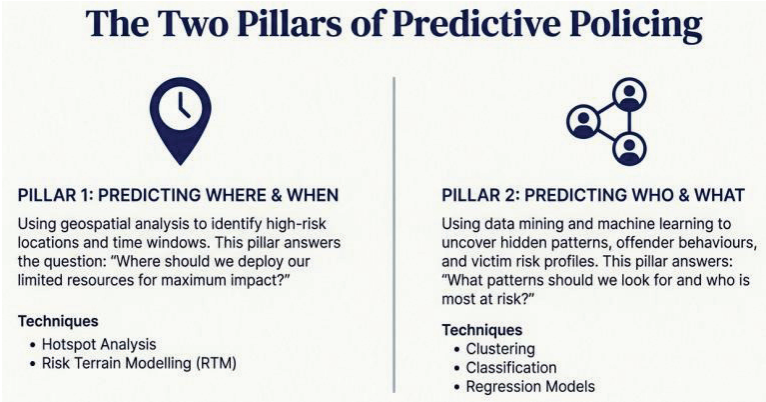
1.2 Core Concept

Predictive policing is not a crystal ball; it is a business process. It involves processing large datasets through predictive models to produce actionable intelligence. The fundamental premise is that crime is not randomly distributed but follows patterns based on environmental factors and human behaviour.



2. METHODOLOGIES AND TECHNIQUES FOR CRIME CONTROL

Hotspot analysis and **data mining** are the two technical pillars of predictive policing that transform law enforcement from a reactive to an initiative-taking force. By leveraging these techniques, police departments in urban cities can optimize limited resources, identify high-risk zones, and anticipate criminal behaviour before it occurs.



Based on the provided sources, here is a detailed breakdown of how these technologies assist in controlling urban crime:

2.1 Hotspot Analysis: Predicting "Where" and "When"

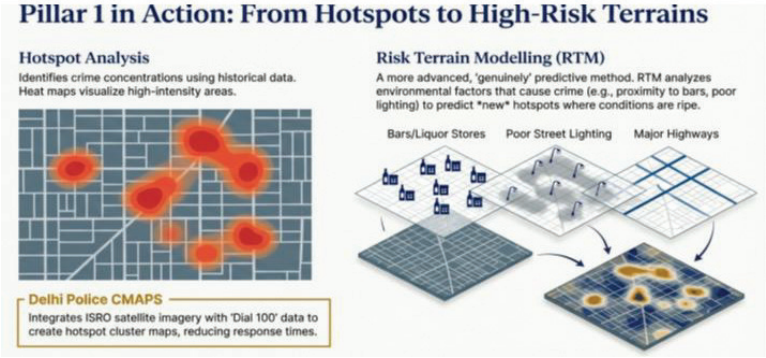
Hotspot analysis is based on the criminological theory that crime is not randomly distributed but clusters in specific areas due to environmental factors and offender habits,

- **Identifying High-Risk Zones:** This technique uses historical crime data to identify geographic areas with high concentrations of criminal activity. By mapping past incidents, police can forecast where crime is likely to occur in the future. For example, the Delhi Police utilize the CMAPS (Crime Mapping Analytics and Predictive System), which integrates ISRO satellite imagery with "Dial 100" data to visualize spatially located calls and identify cluster maps of hotspots.
- **Techniques Used:**

  Grid Mapping & Kernel Density Estimation (KDE): These methods smooth out crime

incident data to produce continuous surfaces (heat maps) that highlight areas of high intensity, allowing police to visualize risk levels across a city.

Risk Terrain Modelling (RTM): Unlike simple mapping, which relies only on past crime, RTM analyses environmental factors that *cause* crime (e.g., proximity to bars, liquor stores, or poor lighting). This allows police to predict new hotspots even if crime hasn't occurred there recently, but the conditions are ripe for it. Based on the provided sources, Risk Terrain Analysis (RTA), also known as Risk Terrain Modelling (RTM), identifies crime spots by analysing the environmental, physical, and social factors that create a suitable context for crime, rather than relying solely on past crime incidents.



2.1.1 Identifying Environmental Risk Factors

Unlike traditional hotspot mapping, which extrapolates future crime based on past event clusters, RTM focuses on the geographic attributes that contribute to crime risk. It analyses specific "risk layers" in a Geographic Information System (GIS). These factors include:

Physical features: Proximity to major highways, bars, liquor stores, apartment complexes, hotels, and fast-food restaurants.

Social and Behavioural factors: The concentration of specific demographics (e.g., young men), the locations of parolee or gang member residences, and areas with high volumes of disorderly conduct calls.

2.1.2 The Operational Process

The identification of crime spots through RTM follows these steps:

Grid Overlay: Analysts lay a grid over the jurisdiction to be analysed.

Layering and Correlation: Separate map layers are created for each risk factor. The system evaluates the statistical relationship between the presence of these geospatial features and specific crimes. Features with a strong positive association with crime are selected for the model.

Composite Scoring: These map layers are combined to produce a "composite risk terrain map." The model counts the presence or intensity of risk-inducing features in

each grid cell. Cells with a higher number of these features are flagged as high-risk zones (often coloured red or orange on maps)

2.1.3 Predictive Capability (New Hot Spots)

A key advantage of RTM is its ability to be "genuinely" predictive. Because it assesses vulnerability based on geography and environment, it can identify new hot spots where crimes have not yet occurred, but where the conditions are ripe for them.

Example: In a case study involving Shreveport, Louisiana, RTM was used to identify high-risk grid cells based on factors such as the presence of probationers, recent vandalism, and "at-risk" buildings. This allowed police to target specific areas that were statistically similar to high-crime areas.

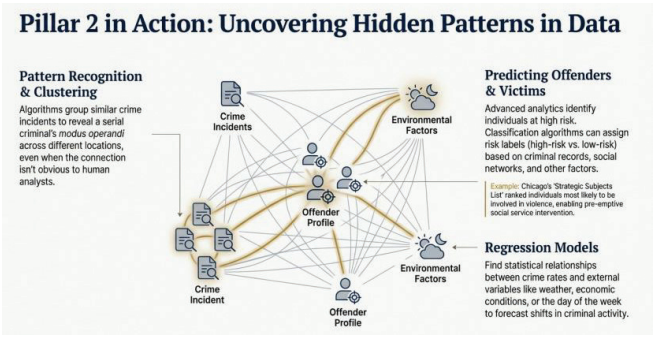
Example: In Morris County, police used RTM to tackle burglaries by analysing five inputs: past burglaries, arrests, proximity to highways, concentration of young men, and locations of housing complexes. This modelling was linked to significant reductions in violent and property crime.

In summary, Risk Terrain Analysis identifies crime spots by diagnosing the "why" and "where" based on environmental vulnerabilities, creating a forecast of areas most likely to attract criminal activity in the future.

Operational Impact (The Koper Curve): Identifying a hotspot is only the first step; acting on it is crucial. Research in Sacramento (USA) evaluated the "Koper Curve" theory, which suggests that police patrols staying in a hotspot for 13–15 minutes create a deterrent effect. This specific intervention strategy led to a 25% decrease in Part 1 crimes (serious offenses) in treated districts.

2.2 Data Mining: Predicting "Who," "What," and "Why"

While hotspot analysis focuses on location, data mining involves searching through vast amounts of data to find useful patterns and trends that are too complex for human analysis.



- **Pattern Recognition and Clustering:** Data mining algorithms, such as clustering, group similar crime incidents together. This can reveal patterns indicating a serial criminal who uses a specific modus operandi across separate locations. For instance, in Derbyshire (UK), data mining was used to combine discrete datasets to identify specific hotspots for juvenile crime.

- **Predicting Offenders and Victims:** Advanced analytics go beyond geography to identify individuals at substantial risk of offending or becoming victims.

  Classification algorithms learn patterns from training data to assign risk labels (e.g., high-risk vs. insignificant risk) to individuals or areas.

  In **Chicago**, the "Strategic Subjects List" used data mining to rank individuals based on their criminal record and social networks to predict those most likely to be involved in violence, allowing for pre-emptive social service intervention.

- **Regression Models:** These models find relationships between independent variables (like weather, economics, or day of the week) and crime rates. For example, regression can help predict how a 10-degree rise in temperature might increase the volume of 911 calls or assaults in a specific neighbourhood.

2.3 Integrated Success Stories

When hotspot analysis and data mining are combined, they allow for "Prediction-Led Policing," where decisions on resource deployment are driven by data rather than intuition.



Memphis (Blue CRUSH): The "Crime Reduction Utilizing Statistical History" (Blue CRUSH) initiative used IBM SPSS predictive analytics to evaluate patrol data against historical trends. This allowed the department to deploy resources to specific blocks and street corners. The result was a 31% reduction in serious crime and a 15.4% reduction in violent crime.

Manchester, NH: By implementing a predictive policing platform that used predictive models to complement hotspot policing, the Manchester Police Department recorded a 28% reduction in total crime within the first 5 weeks of deployment. Specifically, robberies dropped by 12% and burglaries by 21%.

India: Recent research using Random Forest algorithms on Indian crime data (2010–2024) achieved a prediction accuracy (R^2 score) of 92.7%. This demonstrates that machine learning can effectively manage the complex socio-economic and demographic variables present in Indian cities to forecast crime rates.

To effectively control urban crime in India, LEAs must employ a taxonomy of predictive methods classified into four categories: predicting crimes (places/times), predicting offenders, predicting perpetrator identities, and predicting victims.

2.4 Geospatial and Temporal Analysis (Predicting Place and Time)

Hot Spot Analysis: This technique uses historical data to identify areas of high crime concentration. For instance, in Sacramento (USA), police patrols staying 13–15 minutes in identified hot spots (the "Koper Curve") resulted in a 25% decrease in Part 1 crimes, whereas non-treated districts saw a 27.3% increase.

Risk Terrain Modelling (RTM): Unlike simple hot spots, which rely only on past crime, RTM analyses environmental factors (e.g., proximity to highways, bars, or unlit areas) that create vulnerabilities. In Shreveport, Louisiana, RTM was used alongside logistic regression to target property crime, resulting in a 40% decline in experimental districts.

Spatiotemporal Analysis: This combines location with time (e.g., specific hours or days). Heat maps generated from this analysis allow officers to visualize high-risk windows.

2.5 Advanced Data Mining and Machine Learning

Regression Models: These find relationships between independent variables (e.g., weather, economics) and crime levels.

Near-Repeat Analysis: Based on the theory that a crime event increases the risk of future crimes in the immediate vicinity for a short duration. This "earthquake modelling" approach (self-exciting point process) was used in Santa Cruz, reducing burglaries by 19%. Based on the provided sources, here is an explanation of the "Near-Repeat" concept in predictive policing:

2.5.1 Core Concept: The "Earthquake" Analogy

Near-repeat analysis is fundamentally based on the theory that crime is a "self-exciting" process, like seismological activity. Just as a major earthquake is often followed by aftershocks in the same vicinity, the occurrence of a crime creates a temporary "risk zone" in that immediate area.

Elevated Risk: When a crime occurs, the risk of another incident happening nearby rises significantly above the normal background rate for a fleeting period.

Time-Decay: Like aftershocks, this elevated risk is highest immediately after the initial event and fades over time.

2.5.2. The "Contagion" Effect

Researchers also compare crime to a communicable disease. The "communicability" of risk suggests that crime spreads through local environments in micro-time and micro-place.

Example: A study in Los Angeles' San Fernando Valley found that within 3 hours and two hundred meters of a burglary, the risk of victimization increased, leading to over one hundred near-repeat burglaries in that window.

Revictimization: Statistics show that once a location is victimized, the probability of it (or its neighbours) being targeted again doubles.

2.5.3. Why It Happens: Offender Behaviour

The near-repeat phenomenon occurs because criminals tend to operate within their "comfort zones".

Familiarity: Offenders, particularly burglars, return to areas where they have successfully committed crimes because they are already familiar with the layout, escape routes, and security vulnerabilities of the neighbourhood.

Retaliation: In cases of violent crime, such as gang shootings, an initial attack often incites a "wave" of retaliatory violence in the nearby territory of a rival gang.

2.5.4. Implementation in Software

Various predictive policing systems utilize near-repeat algorithms to forecast crime:

PredPol (USA): Uses an algorithm developed by George Mohler (adapted from earthquake modelling) to predict crime by analysing only three data points: crime type, location, and time.

PRECOBS (Germany): Used in states like Baden-Württemberg, this software focuses on residential burglary. It identifies "near-repeat" patterns where an initial break-in triggers an alert for substantial risk in the surrounding area for the next few days.

Crime Anticipation System (CAS) (Netherlands): This system relies on the finding that properties within four hundred meters of a burgled home are at a heightened risk for up to two months after the initial incident.

Near Repeat Calculator: A free software tool developed by Jerry Ratcliffe to help agencies identify these specific space-time clusters in their own jurisdictions.

Machine Learning Algorithms: A recent study on Indian crime data (2010–2024) evaluated various algorithms. The Random Forest algorithm outperformed Support Vector Machines (SVM) and Decision Trees, achieving an R^2 score of 0.927 and a Mean Absolute Error (MAE) of 6.84. This suggests that ensemble learning methods are highly effective for the complex Indian demographic landscape.

3. THE OPERATIONAL FRAMEWORK: FROM DATA TO INTERVENTION

Merely predicting crime is insufficient; the success of predictive policing relies on the "Prediction-Led Policing Business Process".

3.1 Data Collection and Fusion: India is moving toward centralized data through the CCTNS (Crime & Criminal Tracking and Network System).

Data Sources: LEAs must integrate diverse data: FIR data, dial one hundred calls, CCTV feeds, offender registries, socio-economic data, and even weather patterns.

Fusion: Technologies like the NYPD's Domain Awareness System integrate billions of records (license plates, 911 calls, video) to provide real-time alerts.

3.2 Analysis and Prediction: Using software (e.g., CMAPS in Delhi, IBM SPSS, or open-source R tools), analysts process data to generate risk forecasts. The goal is to move from "reactive" to "initiative-taking" by identifying clusters and trends.

3.3 Police Operations (Intervention): Predictions must trigger specific interventions:

Generic Intervention: Increased patrols in predicted red zones.

Crime-Specific Intervention: Deploying decoys in areas predicted for snatching or robbery.

Problem-Specific Intervention: Addressing environmental factors (e.g., fixing streetlights in an RTM-identified vulnerability zone).

3.4 Criminal Response and Assessment: Criminals adapt. If police saturate a hot spot, crime may displace. Continuous assessment is required to update models. For example, the Memphis "Blue CRUSH" initiative reduced crime by 31% by continuously adapting tactics based on data.

4. CURRENT STATE OF PREDICTIVE POLICING IN INDIA

Several Indian states have begun adopting these technologies, providing a foundation for a national rollout.

4.1 Key Initiatives

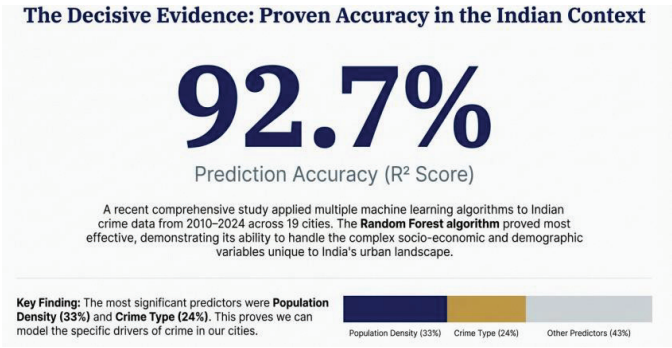
Delhi Police (CMAPS): The Crime Mapping Analytics and Predictive System utilizes ISRO satellite imagery and Dial 100 data to identify hot spots and visualize spatially located calls, aiming to reduce response time and prevent repetition.

Jharkhand: The Open Group on E-governance (OGE) is developing data mining software to scan digitized records, acting as a building block for predictive policing.

Maharashtra: Initiatives include a "predictive policing policy" to tackle cybercrime and social media-fuelled unrest. The state plans to analyse social media in real-time to prevent law and order issues.

Hyderabad: The integration of community CCTV, Automatic Number Plate Recognition (ANPR), and a command centre allows for multi-agency responses. This "Pattern of Life Analysis" helps monitor crowds during festivals to prevent stampedes.

NCRB & ADRIN: A collaboration to develop software utilizing big data analytics to predict crime locations and plan patrolling.



4.2 Empirical Results in the Indian Context: Research utilizing Indian crime datasets (covering nineteen cities including Mumbai, Delhi, and Bengaluru) has validated the efficacy of AI. The study found that population density and crime type were the most expressive features for prediction (contributing 33% and 24% to the model, respectively).

Accuracy: The Random Forest model achieved 92.7% accuracy.

Sample Prediction: For Mumbai (2022), the model predicted a theft rate of 312.6 per 100,000 population against an actual rate of 305.4 (Error: +7.2). For Delhi (2023), the predicted assault rate was 259.4 against an actual 264.8. These tight error margins demonstrate that machine learning is ripe for deployment in Indian urban centres.

From Statistical Accuracy to Real-World Precision

City (Year)	Crime Type	Model Prediction (per 100k pop.)	Actual Reported (per 100k pop.)	Error Margin
Mumbai (2022)	Theft	**312.6**	305.4	+2.3%
Delhi (2023)	Assault	**259.4**	264.8	-2.0%

The minimal error margins in these examples demonstrate that the model is not just theoretically accurate but practically reliable for deployment in major Indian urban centers.

5. LEVERAGING TECHNOLOGY: DRONES AND AI

5.1 UAV/Drone Technology: Drones serve as "eyes in the sky," shifting surveillance from reactive to initiative-taking.

Applications: Crowd management (Hyderabad), border surveillance, and identifying illicit activities like illegal mining or brewing.

Integration: Future trends involve autonomous drones with onboard AI that can detect anomalies (e.g., violent behaviour patterns) and alert control rooms instantly.

5.2 Artificial Intelligence & Cyber Analytics: AI is crucial for processing the volume of data generated by urban centres.

Cybercrime: Systems like those used in Singapore (and proposed for Maharashtra) use AI to detect intrusion patterns, phishing, and ransomware.

Traffic Management: AI cameras in New Delhi detect violations automatically, reducing the workforce required for enforcement and curbing repeat offenses.

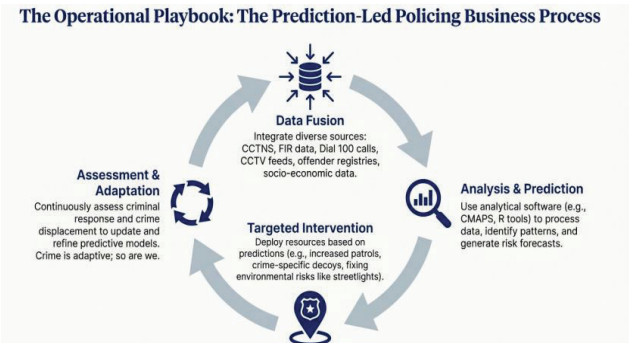
6. CHALLENGES, RISKS, AND ETHICAL CONSIDERATIONS

While the benefits are clear, the implementation of predictive policing in India faces significant hurdles that must be managed to avoid constitutional violations.

6.1 Data Quality and "Garbage In, Garbage Out" Predictive models are only as good as the data fed into them.

Bias: If historical data reflects biased policing (e.g., over-policing specific communities), the algorithm will reinforce this bias, creating a "positive feedback loop".

Data Omission: Under-reporting of crimes in rural or semi-urban areas can skew predictions, making models less effective outside major metros like Mumbai or Delhi.



6.2 Privacy and Constitutional Rights

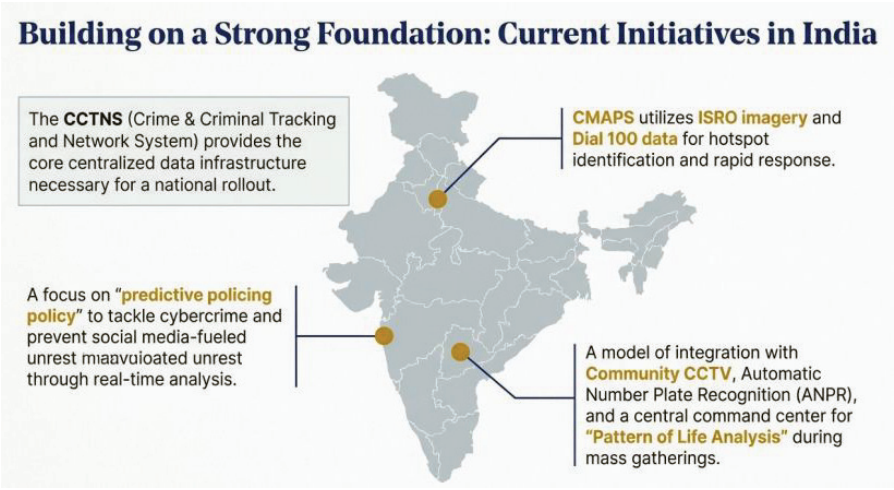
Fundamental Rights: Article 21 (Right to Privacy) and Article 14 (Equality) of the Indian Constitution are paramount. Predictive policing that targets individuals based on opaque algorithms ("Black Box" problem) may violate the presumption of innocence.

Transparency: Algorithms used by police are often proprietary, making them inscrutable to courts. There is a risk of "automation bias," where officers blindly trust the computer's risk assessment without independent judgment.

6.3 Infrastructure and Skills

Cybersecurity: Centralized databases are vulnerable to attacks. A breach could expose sensitive citizen data or cripple police operations.

Skill Gap: Effective use requires not just software, but analysts capable of interpreting complex data. There is often a reliance on private vendors due to a lack of in-house expertise.

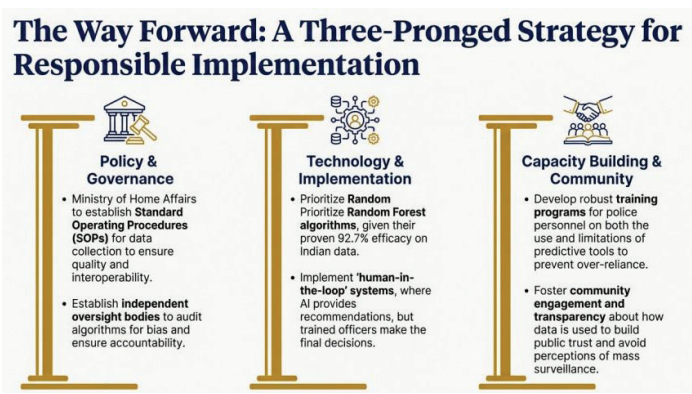


7. RECOMMENDATIONS AND WAY FORWARD

To successfully implement predictive policing in India, a balanced approach combining technology, policy, and community trust is required.

7.1 Policy and Governance

Standardization: The Ministry of Home Affairs should establish standard operating procedures (SOPs) for data collection to ensure interoperability between state police forces.



Oversight: Independent oversight bodies must be established to audit algorithms for bias and ensure accountability, like models proposed in the UK and EU.

7.2 Technological Implementation

Hybrid Models: Use "human-in-the-loop" systems where AI provides recommendations, but final decisions on intervention are made by trained officers.

Focus on Random Forest: Given the empirical success of Random Forest algorithms on Indian data (low RMSE of 9.4), this should be the baseline model for city-level crime prediction.

Data Fusion: Integrate CCTNS data with socio-economic data (Census), weather data, and real-time inputs (Dial 100) to create a comprehensive "Common Operational Picture".

7.3 Capacity Building

Training: Police personnel must be trained not just in using software, but in understanding its limitations to prevent over-reliance.

Community Engagement: Predictive policing should support Community Policing. Transparency with the public about *how* data is used can build trust and reduce the fear of mass surveillance.



8. CONCLUSION

Predictive policing holds the promise of being a game-changing concept for Indian law enforcement. By transitioning from reactive to initiative-taking methodologies, Indian police can optimize scarce resources, reduce response times, and prevent crime before it occurs. The data supports this: pilot programs in the US have shown double-digit percentage drops in crime, and models trained on Indian cities have demonstrated >90% predictive accuracy.

However, this technology must be deployed with caution. It requires a robust ethical framework to prevent bias and protect privacy. If implemented with high-quality data, transparent algorithms, and a focus on community trust, predictive policing can significantly secure the future of India's urban centres.

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Technology Use in Urban Policing: Ground-Level Implementation

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Yashrajsinh Zala**
Annwesha Mazumdar***
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ABSTRACT

Urban Policing in India is transforming with the adoption of advanced technologies at the ground level. The integration of SMART policing tools, including AI-enabled CCTV networks, predictive crime analytics, biometric identification, and mobile-based citizen reporting platforms, has enhanced operational efficiency, transparency, and accountability. Ground-level implementation focuses on beat policing digitization, e-patrol systems, and integrated command and control centers, which help in real-time monitoring and rapid response. Digital assistance platforms such as the 112 India mobile app connect citizens directly with the respective command centres, enabling SOS alerts with GPS-based location tracking for emergency support. The increasing penetration of digital infrastructure in India (about 720 million internet users and 1.2 billion mobile connections in the year 2025) provides a robust foundation for these innovations. It highlights how states such as Uttar Pradesh, Odisha, and Punjab are using technology to address local problems. However, limitations remain in terms of data privacy, digital l literacy, and equitable access across diverse urban populations. Finally, the paper outlines future pathways, specifically how Artificial Intelligence (AI) can be integrated with PCR vans to save lives more quickly. The paper critically examines the operational realities of technology-driven policing in Indian urban areas, highlighting both the recent development and systemic gaps.

Keywords: *Artificial Intelligence, Data Privacy, Digital India, SMART Policing, Urban Policing*

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1. INTRODUCTION

1.1 The Evolution of Indian Policing

For a very long time, the history of policing in India has been stuck in the past. The way our police were organized was primarily determined by the Police Act of 1861[1]. The British colonial rulers enacted this old law to control the population, not necessarily to serve the population. In this old system, the primary focus was on maintaining order through fear and physical presence[2]. The most common tool for a constable was the *lathi* (bamboo stick), and the most essential record was the physical *General Diary*, or Roznamcha, kept at the police station. This was a "reactive" model. This means the police would usually intervene only after a crime had occurred and a victim had approached the *Thana* (police station) to file a First Information Report (FIR).

However, India is changing fast. Our cities are growing at a pace hard to match. By 2030, nearly 600 million people will be living in urban areas[3]. The old methods of manual patrolling and hand-written reports are no longer sufficient to manage such large crowds. The police-to-population ratio in India is roughly 155 officers per 100,000 people, well below the recommended standard[4]. The evolution of Indian Policing is shown in ***Table 1***

Technology acts as a "force multiplier." This means one police officer with the right tools can do the work of three. Modern criminals are also using technology; they use the internet to commit fraud, run organized gangs, and hide their tracks. To fight this, the police must update their methods. In 2014, the Prime Minister called for "SMART" Policing, meaning police should be Strict but Sensitive, Modern and Mobile, Alert and Accountable, Reliable and Responsive, and Techno-savvy and trained. The "SMART" policing is about changing the daily workflow of the police officer on the street.

Table 1: The Evolution of Indian Policing

Feature	Traditional Policing (The "Lathi" Era)	Modern Policing (The "Laptop" Era)
Primary Tool	Bamboo *Lathi* and Notebook	Tablet / *E-Beat Book* and Body Camera
Record Keeping	Physical *General Diary* (Roznamcha) at Thana	Cloud-based CCTNS Database (Digital)
Operational Model	**Reactive:** Act only after the crime occurs and the victim files an FIR	**Predictive:** Use data to prevent crime before it happens
Suspect ID	Manual identification parades or physical photo albums	AI Facial Recognition (e.g., *Trinetra*) and Fingerprint Scanners
Evidence Reliance	Eyewitness testimony (often turns hostile)	Electronic Evidence (CCTV, GPS), which is "admissible."

2. DIGITAL INFRASTRUCTURE IN INDIA (2025)

Technology cannot work in a vacuum; it needs a strong foundation. Fortunately, as of 2025, India

has a robust digital infrastructure that supports modern policing[4]. This infrastructure is built on three main pillars that connect every police station, from remote villages to metro cities.

2.1 CCTNS: The Nervous System

Crime & Criminal Tracking Network & Systems (CCTNS) is the most critical part of this system ***(Figure 1)***. Launched in 2009, this project had a simple goal: to connect all police stations in India to one server[5]. Before CCTNS, if a criminal committed a theft in a police station area in Ghaziabad and fled to Noida, the Noida police would not know his past because records were kept in physical registers that were never shared.

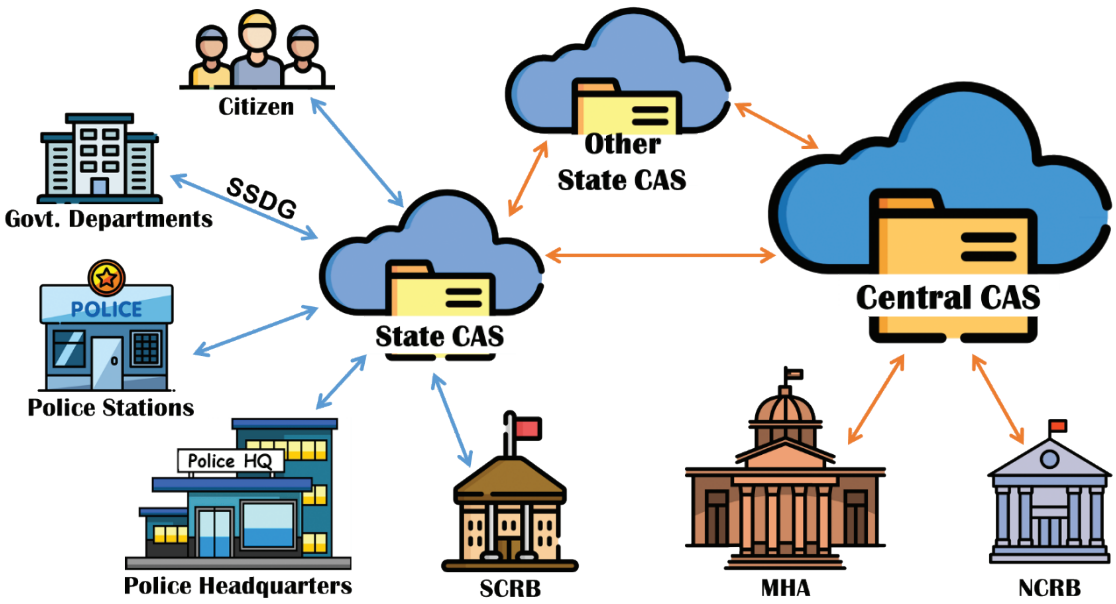


Figure1: ***CCTNS System***

Today, nearly 99% of police stations (about 17,000) are connected[4]. CCTNS allows an Investigating Officer (IO) to search for a criminal's name or vehicle number on a national database. It has ended the era of "information silos." The system records everything from the FIR registration to the Charge Sheet filing[4]. This digitization helps senior officers monitor if an IO is delaying an investigation without cause.

2.2 Interoperable Criminal Justice System (ICJS)

The government has now upgraded it to the ICJS. This is a massive step forward. It connects the five pillars of the justice system (***Table 2***): Police, Forensics, Courts, Prosecutors, and Prisons[6]. ICJS 2.0 is the latest second phase of a national initiative to digitally integrate India's criminal justice pillars. Implemented by the National Crime Records Bureau (NCRB) with technical support from the National Informatics Centre (NIC), scheduled for full completion by March 31st, 2026. It is built

on the principle of "One Data, One Entry", upgraded to align with BNS, BNSS, and BSA, and the Criminal Procedure (Identification) Act, 2022. In January 2026, Uttarakhand Police ranked first in ICJS 2.0 implementation, followed by Haryana and Assam.

Table 2: The 5 Pillars of the ICJS

Pillar	Role in the Ecosystem	Data Integration Benefit
Police	Investigation & FIR Registration	Uploads Chargesheets and Case Diaries directly to the server.
Forensics	Scientific Analysis	Delivers digital reports instantly, preventing court delays.
Courts	Adjudication	Officers can check case status and bail orders online.
Prisons	Custody Management	Updates prisoner release dates to alert police of habitual offenders.
Prosecution	Legal Representation	Accesses all evidence digitally to build a stronger case.

2.3 Connectivity and 5G

The rollout of 5G networks in urban centres has been a game-changer. Older 4G networks were too slow to send heavy video files. With 5G, a patrol car can stream live 4K video footage directly to the Control Room[9]. It allows the commander in the control room to see precisely what the officer on the ground sees, enabling better decision-making.

3. POLICE-FACING TECHNOLOGIES: TOOLS FOR INVESTIGATION AND SURVEILLANCE

This section examines the tools the police force explicitly uses to catch criminals and keep watch over the city. These tools are helping the police move from "guessing" to "knowing."

3.1 The "Trinetra" Model and Criminal Databases

While Delhi and Mumbai often get the spotlight, other states have made giant leaps in using criminal databases. A prime example is the Uttar Pradesh Police and their use of the "Trinetra" App (***Figure 2***(***Figure 2***) and similar tools like Prahari.



Figure 2: ***Trinetra App and its process***

The Trinetra has a database of lakhs of criminals with their photos, criminal history (Crime Number/

Section), and even voice samples[10]. When a police officer sees a suspicious person during a night patrol, they don't have to guess. They can simply take a photo of the suspect using the app. The app uses facial and voice recognition to match the sample against the criminal database[11]. If there is a match, the app instantly shows the officer the suspect's name, their past crimes, and whether they are wanted in any active case[11]. This allows for immediate arrest or preventive action.

3.2 The Digital Eye: CCTV and Facial Recognition

Urban policing has transitioned from "boots on the ground" to "eyes in the sky." Cities like Hyderabad and Chennai have some of the highest densities of CCTV cameras in the world[12]. But it is not just about government cameras. Under various "Safe City" projects, the police are asking private citizens, shopkeepers, and Resident Welfare Associations (RWAs) to install cameras facing the road.

These cameras are linked to Integrated Command and Control Centres (ICCC)[13]. But a human cannot watch thousands of screens at once. This is where Artificial Intelligence (AI) comes in. The AI software constantly watches the video feeds. It is trained to spot specific things[14].

Facial Recognition Systems (FRS) are also becoming standard. In Delhi, this technology was famously used in "Operation Milap" to identify missing children[14]. The computer compares the photo of a missing child with the database of children found in shelter homes across India.

3.3 E-Beat Books and Smart Policing on the Move

The most basic unit of Indian policing is the "Beat." A Beat is a specific area assigned to a constable. For decades, the constable carried a "Beat Book," a physical register in which they recorded details of flawed characters, senior citizens living alone, and important locations. This system was flawed because papers could be lost, torn, or manipulated.

Now, we have "E-Beat Books." These are smart tablets or smartphones given to constables. If a constable visits a senior citizen to check on their safety, they log the visit in the app. The app records the GPS location and time, proving that the officer actually went there. This brings accountability.

Furthermore, these devices often have fingerprint scanners attached, and the on-duty officer can scan the suspect's fingerprints on the spot. This print is sent to the National Automated Fingerprint Identification System (NAFIS), which provides results in seconds.

3.4 Drones: The Eye in the Sky

Drones (Unmanned Aerial Vehicles) are essential police equipment. In states with large religious festivals like the Kumbh Mela in UP or the Rath Yatra in Odisha, drones are used to watch the crowd from above[15]. They help the police spot "choke points" where the crowd is getting too thick, allowing them to stop entry before a stampede happens[16]. In Punjab, the police use advanced drones to monitor the border areas. These drones are used to spot smugglers who try to send drugs or weapons across the border[17].

3.5 Body-Worn Cameras and E-Challans

One of the most common technologies that the public sees every day is the E-Challan system. Now, cameras with Automatic Number Plate Recognition (ANPR) read your license plate and automatically send a *Challan* (fine notice) to your mobile phone. There is no human interaction, so there is no chance for corruption[18].

To further stop arguments and false allegations, traffic police and patrol officers are now wearing Body-Worn Cameras. These cameras record every interaction between the police and the public[19]. If a citizen claims that a police officer was rude or asked for a bribe, the recording can be checked. Conversely, if a citizen attacks a police officer, the video serves as strong evidence in court[20]. This technology protects both the police and the public. Under the Bharatiya Nagarik Suraksha Sanhita, 2023, audio-video recording of search and seizure operations (raids) is now mandatory.

4. OPERATIONAL CASE STUDIES

India is a diverse country, and "one size fits all" does not work. ***Figure3*** shows the various technological adoption of different states to solve crime. Different states have adopted technology in various ways to solve their unique problems, as shown in ***Table 3***.

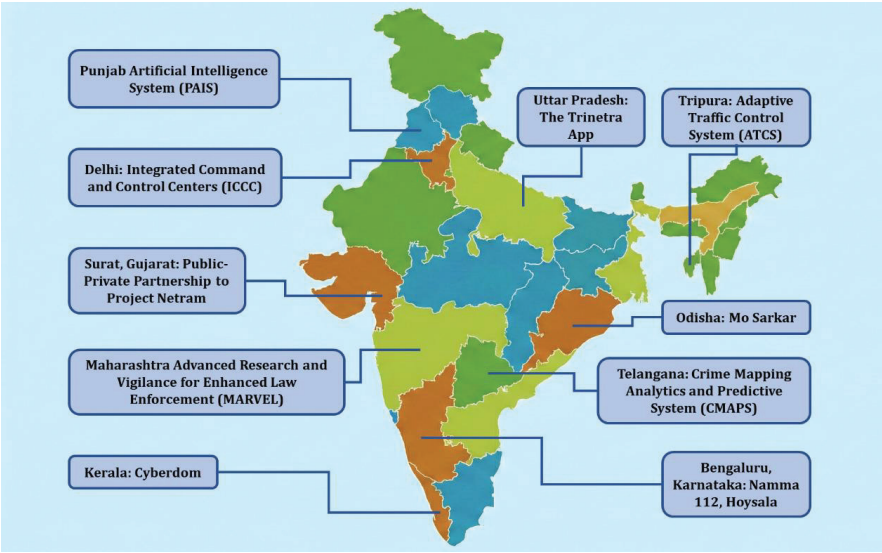


Figure3: ***Various technological adoption of Indian states to combat crimes.***

4.1 The Metro Model: Delhi and Bengaluru

- Delhi (Surveillance Capital): As the national capital, Delhi faces immense security threats. The focus here is on surveillance and crowd control. The Integrated Command and Control Centre (ICCC) in Delhi links thousands of cameras from markets, borders, and residential areas. During

major events like the G20 Summit, this system enabled police to monitor every movement in real time[4].

- Bengaluru (Tech Capital): Bengaluru's "Namma 112" system is focused on speed. The city suffers from massive traffic, so getting a patrol car to a crime scene is hard. To solve this, they use "Hoysala" patrol vehicles equipped with tablets that show the fastest route to the victim, bypassing traffic jams where possible.

4.2 The Tier-2 Model: Surat and Odisha

- Surat (The Diamond City): Surat in Gujarat has a unique model. Instead of the government paying for everything, the businessmen (diamond and textile merchants) partnered with the police. They linked their high-quality private CCTV cameras to the police control room under Project NETRAM. This "Public-Private Partnership" (PPP) has helped solve many serious crimes like chain snatching and murder[23].
- Odisha (The "Mo Sarkar" Initiative): Odisha has taken a different approach focused on feedback. Under the "Mo Sarkar" (My Government) initiative, anyone who visits a police station receives a call from the Chief Minister's office or a senior officer asking about their experience[24]. This feedback is recorded digitally. If an officer gets bad feedback, they are punished.

4.3 Specialised Policing: Kerala's "Cyberdome"

Kerala Police faced a different challenge: Cybercrime. To fight hackers and online fraudsters, they set up the "Cyberdome." This is a research centre where police officers work alongside civilian volunteers, ethical hackers, and software engineers[25]. These "Cyber Commanders" help the police track criminals on the Darknet (a hidden part of the internet used for illegal trade). They have successfully busted child pornography rings and online drug markets that regular police could never find. This shows that the police do not always need to know everything; they need to know who to ask.

Table 3: State-wise Technology Adoption Models

State / City	Key Initiative	Primary Focus	Impact / Outcome
Delhi	ICCC & Facial Recognition	Surveillance & Crowd Control	Real-time crowd monitoring during major events, such as the G20.
Bengaluru	*Namma 112* & Hoysala Vans	Response Time Speed	Reduced violent "hurt cases" by 9% due to faster arrival.
Uttar Pradesh	*Trinetra* App	Criminal Database Tracking	Identifies criminals via facial recognition during patrols.
Surat (Gujarat)	Project *NETRAM*	Public-Private Partnership (PPP)	Solved 220+ serious crimes using merchant-owned cameras.
Odisha	Mo Sarkar	Citizen Feedback & Accountability	Improved behaviour in rural stations through direct feedback calls.
Kerala	Cyberdome	Cybercrime & Darknet	Busted online drug markets and child pornography rings.

5. DIGITAL ASSISTANCE PLATFORMS

While the previous section discussed tools used by the police, this section focuses on tools used *by* the public. This is where the shift from a "Force" to a "Service" becomes most visible. The goal is to make the police accessible to every citizen, regardless of where they live or what time it is.

5.1 The "112 India" Revolution: One Nation, One Number

For decades, Indians had to remember different numbers for different emergencies: 100 for the Police, 101 for the Fire, and 108 for the Ambulance. This was confusing and inefficient. The government introduced the Emergency Response Support System (ERSS), popularly known as Dial 112. This is a unified system similar to "911" in the United States.

The "112 India" Mobile App is a lifeline for citizens. It has a special "Panic Button" feature. If a woman is in danger or being stalked, she does not need to unlock her phone and dial a number. She can press the power button on her phone three times quickly. This sends a silent "SOS" alert to the nearest Emergency Response Centre (ERC)[21]. The alert includes her live GPS location. The police control room can see precisely where she is moving and dispatch the nearest patrol vehicle immediately. This system has significantly reduced police response time.

5.2 Social Media as a Reporting Tool

In the age of Twitter (now X) and Facebook, the police are just a "tag" away. Most state police forces, including Mumbai Police, Delhi Police, and Bengaluru City Police, have very active social media cells[22]. Citizens often report traffic violations, lost items, or cyberbullying directly on these platforms. A tweet with a photo of a wrongly parked car often leads to an immediate *E-Challan* being issued. This has made the police more responsive and accountable because the complaint is public and cannot be ignored.

6. CHALLENGES AND ETHICAL CONCERNS

6.1 Data Privacy and Security Breaches

When we digitize policing, we create massive databases of personal information. This data includes names, addresses, fingerprints, and even citizens' movement logs. If this data is stolen, it can be dangerous.

In 2024, the database of the Hyderabad Police's "Hawk Eye" app was reportedly hacked. Sensitive data of over 2 lakh users, including SOS requests from women, was leaked on the internet[26]. This incident is a wake-up call. It highlights that "Digital India" must also be "Secure India."

6.2 The Digital Divide: Justice for the Poor?

Technology often assumes that everyone has a smartphone and high-speed internet. If reporting a crime requires an app, then the poor are excluded. A person who cannot read or write cannot use an E-FIR system. We risk creating a two-tier justice system: one that is fast and efficient for the rich and educated, and another that is slow and difficult for the poor.

6.3 Algorithmic Bias and False Arrests

Facial Recognition Technology (FRT) is not perfect. Most of the software used in India is trained on databases of foreign faces[27]. Studies show that these algorithms sometimes struggle to identify Indian faces correctly.

Imagine a scenario where an innocent person is walking in a market. The CCTV camera wrongly identifies them as terrorists because they look similar. The police detain them. This violates their Article 21 (Right to Life and Liberty)[28]. In a democracy, the risk of arresting an innocent person based on a computer error is a serious ethical issue.

7. THE LEGAL FRAMEWORK: BHARATIYA NAGARIK SURAKSHA SANHITA (BNSS), 2023 AND DIGITAL PERSONAL DATA PROTECTION ACT (DPDPA), 2023

The laws of India have recently been updated to keep pace with technology. The Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023, has replaced the old Code of Criminal Procedure (CrPC). This new law makes technology *mandatory*, not optional.

7.1 Mandatory Videography of Search and Seizure

Section 105 of the Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023 says that the entire process of a police raid (search and seizure) *must* be recorded on video[29]. This video must be preserved as evidence. Now, the police must show a video of *where* they found the item and *how* they sealed it. This video must be uploaded to a cloud server to prevent tampering. This protects honest citizens from false charges. ***Table 4*** shows the legal framework comparison: Code of Criminal Procedure (CrPC), 1973 vs. Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023 .

Table 4: Legal Framework Comparison (CrPC vs. BNSS)

Provision	Old Code (Code of Criminal Procedure, 1973)	New Code (Bharatiya Nagarik Suraksha Sanhita, 2023)
Search & Seizure	Relied on witness signatures; highly prone to disputes.	**Mandatory Videography** of the entire process (Section 105) to prevent tampering.
Witness Testimony	Required physical presence in court wastes police time.	Allows **Electronic Trials** via video conference (Section 530).
Arrest Protocol	Based on suspicion or warrant.	**Identification by Database** allowed; supports preventive action (Section 35/170).
Evidence Type	Physical evidence preferred.	**Electronic Evidence** (CCTV, Location) is given substantial weight.

7.2 Electronic Trials and Evidence

Section 530 of the Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023 allows trials to be held electronically. This means a police officer does not need to waste a whole day travelling to a court to say, "Yes, I filed this FIR." They can testify via video conference from the police station[30]. This saves thousands of person-hours, allowing the officer to focus on solving other crimes.

7.3 The Data Protection Dilemma

The Digital Personal Data Protection (DPDP) Act, 2023, regulates the use of data. However, Section 17 of this Act gives the government broad exemptions for "maintenance of public order". This creates a tension. While it allows the police to use surveillance to catch terrorists, it also means there are very few checks on how much data the police collect on ordinary citizens[31]. There is currently no specific "Police Data Protection Code," a gap that needs to be addressed.

8. FUTURE DIRECTIONS

8.1 The Current Gap

Right now, when a citizen dials 112, the operator dispatches a PCR (Police Control Room) van.

While 112 provides swift law and order deployment via PCR vans, there is a critical functional gap in immediate medico-legal management. The current protocol prioritizes reactive policing over integrated first responder care, leaving responding officers tasked with complex situations; at the same time, there is a significant void in training, which makes it difficult to handle the situation.

8.2 The Proposed Solution: AI on Wheels

We suggest equipping every PCR van with an AI-Integrated Tablet linked directly to the Central Command Centre (***Figure 4***). Here is how it would be:

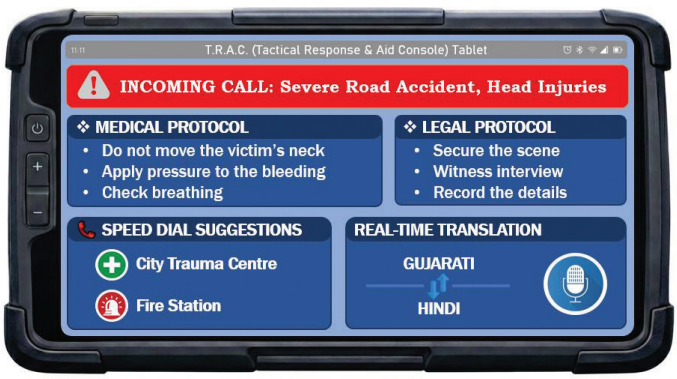


Figure 4: *Illustration of AI on wheels*

1. Real-Time Analysis: When a call comes in (e.g., "There is a severe road accident with head injuries"), the AI at the command centre analyses the keywords ("accident," "head injury").
2. Instant Guidance for the Van: Before the van even reaches the spot, the AI sends a "Mission Pack" to the tablet in the van.
   - Medical Protocol: The screen flashes simple instructions for the officer: "Do not move the victim's neck. Apply pressure to the bleeding. Check breathing." This turns the officer into a versatile first responder.
   - Legal Protocol: If the call is about a domestic violence case, the AI reminds the officer: "Do not enter without a female officer if it is night (unless emergency). Record video immediately under Section 105 of the Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023."
3. Speed Dial Integration: The AI automatically identifies the nearest hospitals and fire stations. It does not just show a map; it "speed dials" the hospital's emergency room to warn them: "A

head trauma patient is coming in 10 minutes." This prepares the doctors *before* the patient arrives, potentially saving a life.

4. Language Translation: In a diverse country like India, an officer might not speak the language of a victim (e.g., a Tamil tourist in Delhi). The AI tablet could act as a real-time translator, allowing the officer to take a statement immediately without waiting for a translator.

In the future, these vans will not just wait for calls. The AI will analyze crime data and tell the van: "Go to Sector 4 Market. Chain snatching is high here between 6 PM and 8 PM." This places the police at the scene *before* the crime happens.

CONCLUSION

The transformation of urban policing in India is undeniable. We have moved from manual, paper-based record-keeping to modern digital systems like biometric scanners, CCTNS, Dial 112, and AI surveillance. These technologies have made our cities safer and our police more accountable.

However, technology is a double-edged sword. It brings efficiency, but it also carries risks of privacy breaches and the exclusion of people on low incomes. As we move forward, we must remember that a "Smart" police force needs more than just smart gadgets; it needs smart laws and smart ethics. The hardware is ready; now we must upgrade the "software" of the force's mindset and the public's trust. The future of Indian policing lies not in replacing the human officer, but in empowering them with AI to serve every citizen with speed, sensitivity, and strict adherence to the law for public privacy and data safety.

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Standardisation of Police Training Institutions and Capacity Building for Urban Policing in India

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ABSTRACT

The rapid urbanisation in India is projected to result in seventy per cent (approx.) of the population residing in urban areas by 2047, which is expected to pose a significant challenge to Policing and internal security. This demographic shift has unprecedented effects on law enforcement agencies and requires their transformation from a traditional setup into a sophisticated, resilient, and well-trained police force for urban safety. Police Training Institutions (PTIs) serve as the bedrock of Policing & law enforcement capacity building in India. However, police training is characterised by structural variations in infrastructure, curriculum, quality of trainers, and resources across the 36 States/Union Territories and 15 Central Armed Police Forces (CAPFs)/ Central Police Organisations (CPOs).

This paper examines the current status of the Police Training ecosystem in India and evaluates the institutional responses initiated primarily through the Bureau of Police Research and Development (BPR&D). It underscores urban policing as a critical issue to highlight that the standardisation across PTIs is not only limited to administrative aspects but should also be acknowledged as a strategic imperative. The study is based on a qualitative methodology and draws evidence from government reports, BPR&D publications, National Crime Records Bureau (NCRB) data, deliberations of commissions & committees, and literature on global policing.

The findings indicate that standardisation of Police training is a foremost institutional priority for the Ministry of Home Affairs, Government of India. Major significant institutional reforms such as implementation of standardised syllabi for the ranks of Deputy Superintendent of Police (Dy.SP), Sub-Inspector, and Constable, the Ranking of PTIs, the designation of Centres of Excellence, the Award of President's Police Colours, the creation of a National Pool of Master Trainers and development of a national training portal are salient initiatives for capacity building for a future ready police force with a strong focus on public safety in urban areas.

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The urban policing challenge encompasses a wide array of areas like the management of smart cities, terrorism, cybercrime, digital policing, social media, crowd control, critical infrastructure protection, gender-sensitive approaches and community policing paradigms, etc. The above-enumerated challenges require uniform and advanced competencies to be developed across the training ecosystems. The study concludes with an actionable roadmap aligned with the Viksit Bharat Vision 2047 and highlights an integrated, standardised and advanced police training ecosystem capable of preparing a resilient human resource for an ever-changing security landscape.

Keywords: Standardisation, Police Training Institutions, Capacity Building, Bureau of Police Research and Development, Police Reform, Urban Policing, Vision 2047

INTRODUCTION

The report titled 'Towards Resilient and Prosperous Cities in India' (2025), published by the World Bank in collaboration with the Ministry of Housing and Urban Affairs, GoI, states that India's urban transition is rapidly proceeding at an unprecedented scale, with an estimation that the urban population will double to 951 million by 2050. This rapid urbanisation entails a massive expansion of infrastructure, public services, transportation & traffic management, settlements and complex community interactions, which further creates demands on policing ranging from management of law & order to new-age crime control and crisis response. The Crime in India 2023 Report (NCRB, 2023) indicates that urban spaces have also demonstrated critical vulnerabilities, including rising crimes against women & children, economic offences and cybercrimes in metropolitan cities.

These patterns have indicated the identification of specialised competencies for the Police personnel and their capacity building in cyber investigation, social media analysis, critical infrastructure protection, public order, intelligence management, financial crime, victim support, community policing, implementation of Nyaya Sanhitas and their digital aspects, soft skills, etc. These emerging areas demand a larger shift from traditional policing to a SMART Policing framework commensurate with the evolving paradigm of public safety.

The edifice of a democratic policing system is intricately linked to the quality of the training imparted to the police personnel. In a country as vast and heterogeneous as India, with over 2.75 million sanctioned police personnel across state forces and 1.13 million across Central Armed Police Forces (DOPO, BPR&D, 2024), the manner in which training is designed, delivered, and evaluated carries immense consequences for public safety, Criminal Justice administration, and National Security. Yet, despite decades of calls for reform, India's Police Training Institutions (PTIs) continue to face serious and systemic disparities that are inconsistent with the objectives of a professional and capable force. Police, as a subject listed in the Seventh Schedule of the

Constitution of India, falls under the legislative and administrative purview of the States. This arrangement has historically produced a variety of training standards in which the quality of police personnel varies and depends substantially on the State/UTs in which they are recruited. This disparity does not merely cause administrative inconvenience, but it results directly in differential levels of competence and functioning of the Police personnel.

The challenges are compounded by the rapidly evolving nature of crime and public order challenges and the use of technology linked to cybercrime, financial fraud, organised transnational crime, terrorism, and online radicalisation, etc. Simultaneously, the expectations of citizens regarding police actions, accountability, gender-sensitivity, and human-rights compliance have grown significantly. In this scenario, PTIs are now expected to train & prepare officers for more complex and dynamic operational environments.

Additionally, it is imminent that the training institutions operate under standardised and uniform frameworks to ensure consistency in responding to the new-age crimes and crisis situations. Standardisation ensures the development of the baseline tactical, technical, legal, and soft skills required to manage the complexities of modern urban environments.

Recognising these challenges, the Bureau of Police Research and Development (BPR&D), as the think tank, apex police research & advisory body under the Ministry of Home Affairs, Government of India, has undertaken numerous institutional initiatives. These include the development of standardised training syllabi for directly recruited Dy.SP, Sub- Inspector and Constables, a gap analysis exercise for PTI assessment, establishment of Centres of Excellence, a National Pool of Master Trainers, the award of President of India's Police Colours as institutional recognition to PTIs, a Ranking and benchmarking system for PTIs and development of a National Training Portal. However, it is pertinent to mention that BPR&D operates in the capacity of an advisory body and lacks direct authority over State PTIs.

The central question in this paper is how India can move from a fragmented training ecosystem to a comprehensive ecosystem with common minimum standards and benchmarking for PTIs. The analysis addresses this question by mapping current challenges, examining BPR&D initiatives, a brief comparison with global models of police training, and outlining a Vision 2047 roadmap.

LITERATURE REVIEW

The scholarship on reforms in the police training ecosystem in India is rich in normative prescription and lacks empirical depth, resulting in a gap that reflects the challenge of data availability on various aspects of Police Training. The reports of successive committees are instrumental in highlighting the systemic issues related to training and capacity building of police personnel. The National Police Commission (1977-1981), while drawing upon and appreciating the Gore Committee Report (1971), identified various aspects of training as a means to police modernisation. The Commission's observation that training institutions functioned largely as 'holding grounds' for unwanted officers rather than centres of excellence highlighted the gaps in Police training in India. (National Police Commission, 1980)

The Padmanabhaiah Committee (2000) provided a more objective assessment, recommending a Police Training Advisory Council and central assistance to States meeting certain minimum standards for training, among others. The fifth Report of the Second Administrative Reforms Commission (2005) on public order emphasised both technical and behavioural training competencies for police personnel and called for a standardised national training curriculum that could be adopted by States while including regional priorities. The Soli Sorabjee Committee's Draft Model Police Act (2006), while focusing on structural reforms, highlighted relevant provisions on training standards, including in-service training of police personnel.

The scholarship on police training in India has been explored through multiple dimensions. Verma (2005) offered a sociological understanding of the continuity of colonial components in training content, with emphasis on crowd control and order maintenance rather than skills in Investigation and Community Policing. Raghavan (2012), referring to the comparative study with the United States, highlighted that the absence of the mechanism of standardised certification in India left training standards entirely at the discretion of States. The assessment by Commonwealth Human Rights Initiative (CHRI, 2016) highlighted the significant shortfalls in facilities, trainer qualifications, and variations in training curriculum across States. The BPR&D's publications, Data on Police Organisations in India (2024) and Data on Indian Police Training Institutions (2024), provide official statistics on the status of Police training infrastructure and human resources in India.

Globally, the literature on reforms in police training has emerged substantially since the early 1980s. Bayley (2006) argued that effective police reform in any country required sustained investment in training institutions for building a professional culture of accountability and service. Greene (2000) demonstrated that the shift to community policing requires reforms in training content towards problem solving, communication, and ethics. Sklansky (2011) explored the dynamics between professionalisation and democratisation in police training, which is also relevant to the Indian context where reconciliation remains a challenge between acquiring technical competence and skills of community policing.

Criminological studies in urban contexts like (Hrithic S & Dr. Sana Humd, 2026) highlight how rapid urbanisation, environmental stressors and weakened community relationships reshape crime patterns, indicating the need for policing strategies that are psychologically prudent and sensitive. Indian and comparative contexts further demonstrate that skewed urban growth, migration and stark inequality lead to urban stress, feelings of relative deprivation and social disorganisation, which heightens the risks of violence, property crime and public disorder.

The European Union Agency for Law Enforcement Training (CEPOL) framework has received global attention as a mature model for cross-jurisdictional training standardisation. The College of Policing in the UK has introduced the Policing Education Qualifications Framework (PEQF) for integration of university-level education with police training. Singapore's Home Team Academy (HTA) is globally recognised for its integration of simulation technology with competency-based training.

A notable gap in the existing literature pertains to the impact of initiatives on training outcomes in Indian PTIs. Most assessments remain limited to statistical documentation rather than measuring the improvements in training quality.

METHODOLOGY

Research Design

Given the nature of the research problem, which focuses on institutional gaps, policy initiatives, and reform, a qualitative research design has been adopted. The study also includes institutional experiences from other countries. The research is descriptive as per the desired objectives of the paper.

Data Sources

The study relies exclusively on secondary sources, reflecting both the strengths and limitations of this approach. The data sources comprise Government of India reports, including BPR&D Data on Police Organisations in India (2024), Directory of Indian Police Training Institutions (DIPTI 2024), MHA Annual Reports, parliamentary committee reports, BPR&D's model syllabi for Dy.SP, Sub-Inspector, and Constable ranks, peer-reviewed articles from journals, international policing publications, including those of the College of Policing (UK), the FBI National Academy (USA), Police Executive Research Forum(PERF), Singapore's Home Team Academy, and the Australian Institute of Police Management.

Limitations

Many States/UTs do not publish detailed training data, and the publicly available data generally obscures the intra-State variations. Second, the absence of national data on PTI performance metrics, covering quantitative and qualitative indicators, limits the scope of the gap analysis. Third, the interpretation must acknowledge differences in socio-political and historical contexts. The paper acknowledges these limitations and presents its findings supported by available data.

ANALYSIS

The Current Landscape of Police Training Institutions in India

India's civil police training architecture operates at three broad tiers. At the apex, the Sardar Vallabhbhai Patel National Police Academy (SVPNPA) in Hyderabad provides the foundational training for Indian Police Service (IPS) probationers and conducts advanced training programmes for senior police officers. The second tier comprises State/UTs Police Training Academies, Police Training Colleges, and Police Training Schools. The third tier encompasses district-level Recruit Training Centres (RTCs). The State Level Academies and Colleges are generally used for training Gazetted Officers and Non-Gazetted Officers, while the RTCs are used for training Constables. All PTIs also impart in-service training as required for upgradation of skill competencies. For CAPFs and CPOs, a network of Basic Training and specialised training institutes has also been established.

The BPR&D's DIPTI Data (2024) mentions a total of 350 Police training institutes across the country. A total of 218 State PTIs, 18 UT PTIs, and 114 for CAPFs/CPOs have been established. However, this aggregate figure does not reflect the actual variation in institutional capacity and quality. While a few State Police Academies like Kerala, Tamil Nadu, Maharashtra, Telangana, and Rajasthan have developed into relatively well-resourced institutions with modern physical training facilities, simulation ranges, and qualified faculty, several smaller States/UTs lack even a dedicated training facility. The Parliamentary Standing Committee on Home Affairs (2020) observed that 30% of PTIs across India have an inadequate number of indoor firing ranges and simulation-based training equipment.

CHALLENGES FACED BY POLICE TRAINING INSTITUTIONS

a) Infrastructure Disparities

Physical infrastructure constitutes the most visible aspect of disparity across PTIs. Well-resourced PTIs encompass campuses with trainee hostels, auditoriums, libraries, FSLs, cybercrime & ICT labs, mock rooms, simulators, obstacle courses, stadiums and swimming pools. At the other end, PTIs in some States/UTs lack adequate basic residential and training facilities. The absence of standardised minimum infrastructure norms across States has led to gross variation.

CAPFs, on the other hand, are generally better resourced than State PTIs due to central funding. However, the variations, albeit minor, in infrastructural inadequacy are also apparent among CAPFs.

b) Faculty Quality and Trainer Development

The most significant challenge facing the PTIs is the quality and morale of training faculty. Across States/UTs and CAPFs, the model of faculty appointment involves the deputation of serving police officers to training institutions for fixed tenures. While this system ensures that trainers bring operational expertise, it does not prioritise training competence. A systematic lacuna remains - the lack of any structured Training of Trainers (ToT) in methods like principles of adult learning, curriculum design, training methodologies, or assessment skills that are fundamental to effective training outcomes. Studies suggest that many officers regard deputation to training institutions as less prestigious compared to field postings, underlining the lack of motivation and morale that further compromises the training quality (Verma, 2005).

The absence of a dedicated cadre of faculty/master trainers indicates that institutional knowledge is continuously lost as instructors move out of PTIs. This affects the quality of curricula, and the gap between the redundant training content and contemporary challenges remains unattended. The Training of Trainers (ToT) programme initiated by BPR&D on various thematic areas has attempted to address this gap, but its extent has been limited given the large number of institutions and trainers involved.

c) Curriculum Standardisation Gaps

Training curricula across States/UTs exhibit significant variation in content, duration, and methodology. While certain core subjects like Criminal Laws, physical training, and first aid are

consistent, there is notable difference in the coverage of contemporary policing subjects e.g., Cybercrimes, Forensics, gender-sensitive policing, community policing, Health and Nutrition, disaster & crisis management, financial investigation, Use of technology, etc. In some States, curriculum revision has not been undertaken for more than a decade, which resulted in a poor training ecosystem that does not reflect the contemporary challenges and operational realities (CHRI, 2016).

The duration of training for the rank of SI and Constable also varies along with the quality and content of this training. This creates a situation in which officers of the same rank across States may possess different levels of skills and competence.

d) Resource Allocation and Budgetary Constraints

Training expenditure as a portion of total police expenditure is not consistent across States, leading to difficulty in comparative analysis. However, available data and qualitative assessments consistently indicate that training is acutely underfunded in many States.

The DIPTI data for FY 2023-24 reveals a pattern of under-investment in police training across Indian States/UTs. The portion allocated to training remains negligible, often below 2% of total police budgets, and a meagre share of total state budgets.

However, Police expenditure as a proportion of the total state budget ranges from approximately 3.0% in Haryana and Madhya Pradesh to over 10% in Manipur, reflecting the relationship between conflict-affected regions and increased spending on Policing. Assam (6.0%), Bihar (4.7%), Jharkhand (5.2%), and Maharashtra (4.8%) fall within a moderate range consistent with the national average. These allocations highlight that policing is a crucial function of the state and occupies a central fiscal footprint.

TRAINING EXPENDITURE AS A SHARE OF POLICE BUDGETS

The ratio of training expenditure to total police budget demonstrates interstate variations, though the aggregate landscape highlights a systemic neglect. Madhya Pradesh leads at approximately 1.90% of its police budget, followed by Assam (1.71%), Himachal Pradesh (1.31%), Jharkhand (1.21%), and Manipur (1.04%). Bihar (0.64%), Nagaland (0.61%), and Haryana (0.78%) represent the lower end. Maharashtra, with a reported training expenditure, records a low ratio of approximately 0.03%. The above figures reflect the current fiscal priority of Police Training by States in India.

INSTITUTIONAL INITIATIVES BY BPR&D AND MHA

a) Standardised syllabi for different ranks

The Ministry of Home Affairs constituted an Apex Committee in the year 2023 on 'Modernisation of Basic Training for Deputy Superintendents of Police, Sub-Inspectors and Constables of Civil Police', supported by three sub-committees on Indoor Training, Outdoor Training, and Methodology & Infrastructure. These committees were anchored by BPR&D and Sardar Vallabhbhai Patel National Police Academy (SVPNPA) and comprised senior police leaders and experienced trainers from multiple States, CAPFs & CPOs, thereby providing a wide consultative premise for reform in the syllabus.

As part of this exercise, SVPNPA Hyderabad conducted a large-scale Training Needs Analysis (TNA) across eight states, securing more than 14,000 responses from DySPs, Sub-Inspectors and Constables on the efficacy of existing training and their perceived skill levels. This was complemented by Framework of Roles, Activities and Competencies (FRAC) exercises for each rank and a nationwide BPR&D survey of police training institutions to benchmark available infrastructure and methodologies against a common norm.

In addition, BPR&D organised six zonal workshops with police officers and trainers from all States/UTs to present the proposed modern curricula, invite feedback and incorporate best practices. The deliberations of these zonal workshops, the findings of TNAs and FRAC exercises, and the mapping of institutional infrastructure have been consolidated into the Indoor and Outdoor Training Committee reports, which also emphasize the standardisation of Police Training for effective outcomes.

These nationwide consultations, together with large-scale Training Needs Analyses and institutional assessments, culminated in a standardised yet locally adaptable all-India basic training syllabus of the three ranks with approximately 75-80% common and 20-25% state-specific content addressing regional priorities.

The new syllabi for the three ranks have recognized the emerging complexity of urban policing. The modules are designed to equip officers with the knowledge and skills required to address challenges unique to urban areas like traffic management, organized crime, cybercrime, public disorder, intelligence, cyber security, critical infrastructure protection, disaster response, and community policing, etc. A uniform baseline of competencies shall ensure greater preparedness among police personnel, irrespective of their jurisdictions, to effectively manage the evolving demands of public safety in urban areas.

b) Gap analysis of PTIs

BPR&D is conducting a gap analysis of Police Training Institutions in all 36 States and Union Territories against the standard BPR&D norms. The objective of the exercise is to assess inadequacies of infrastructural and institutional deficiencies and to determine the amount of central assistance required for the development and upgradation of facilities in PTIs. The proposed central assistance intends to support the implementation of the standardised direct recruitment syllabi for the ranks of Deputy Superintendent of Police, Sub-Inspector and Constable, thereby promoting greater quality, uniformity, and benchmarking in police training across the country.

c) Award of President of India's Police Colours to PTIs

BPR&D has prepared the Standard Operating Procedure for the award of the President of India's Police Colours encompassing the eligibility criteria for States/UTs Police, CAPFs, and PTIs. For PTIs, the criteria include institutional legacy, contribution to police training, curricular and professional achievements, promotion of sports, welfare, sustainable technologies, and improved performance across the years. The criteria also include the legacy of policing & law enforcement and quality assurance. Proposals are reviewed by MHA, with BPR&D conducting a detailed scrutiny against the notified criteria. Distinguished recognition through Police

Colours can promote excellence through a healthy competition to upgrade and standardize the training institutes.

d) Centres of Excellence based on a hub and spoke model

BPR&D has designated its Central Detective Training Institutes and the Central Academy for Police Training as Centres of Excellence in domains such as counter-terrorism, community policing & vulnerable sections, new-age crimes, organised crime, traffic technology, prison and correctional administration, and police technology. The identified CoEs also include the specific domains of Urban Policing under their aegis.

The hub and spoke model allows the CoEs to function as hubs for imparting standardised advanced courses, develop unique instructional methodologies and support for the spokes, i.e., State-level PTIs and other force formations. This model needs to be encouraged among States and CAPFs for training of trainers, their exchange, joint certification, training resources and handholding.

The present directive is to ensure that the CoEs must be developed as per the mandate and the scope of a PTI and should be unique to avoid duplication and optimal resource utilisation. Additionally, the institutional outcomes of CoE should be systematically shared with all Police forces to ensure a standardised knowledge repository.

e) National pool of master trainers and ToT programmes

The creation of a National Pool of Master Trainers is a significant intervention to address the pressing challenge of quality of trainers across the PTIs. This initiative envisages preparing a cadre of expert police officers with demonstrated experience, aptitude and domain specialisation at the outlying units of BPR&D and designated training institutes.

Officers who complete the ToT programme are certified as Master Trainers and registered in a national pool that States and CAPFs can draw upon for their faculty requirements. The initiative addresses the challenge of quality and continuity by creating a cadre of professionally certified trainers whose expertise is formally recognised and whose availability is coordinated nationally. BPR&D, through its outlying units, has trained Trainers across domains like cybercrime, forensics, and counter-terrorism, etc.

As part of the rollout of the Nyay Sanhitas, BPR&D has created a national pool of master trainers from police, prisons, prosecution, judiciary, and forensic verticals. Similarly, very recently, BPR&D commenced the National Training of Master Trainers on the newly introduced Foreigners and Immigration Act, 2025.

Additionally, digital platforms such as iGOT Karmayogi host e-content on various thematic areas of policing and facilitate self-paced learning. Although a substantial outcome of this initiative is yet to be realised, this initiative aims at standardising modules, learning outcomes, and digital delivery at the national level. The creation of Master trainers to develop digital content is also being operationalised at the level of BPR&D.

f) Ranking and benchmarking of PTIs

The Standard Operating Procedure along with the criteria for a formal national ranking of PTIs has been approved by MHA. The SOP & criteria prepared by BPR&D represent a more

systematic framework for benchmarking and standardisation. The framework evaluates institutions on parameters and indicators covering training infrastructure, courses & methodology, administrative practices, welfare and additional parameters pertaining to the BPR&D-monitored activities. It focuses on mapping the variety of courses, digitisation efforts, training resource materials, faculty competence, adoption of technology, training outcomes and institutional governance. The Ranking shall enable the States/UTs/CAPFs/CPOs to assess their relative positions nationally, identify specific areas of strength & weakness and adopt the best practices of top-ranked PTIs. Over the next few years, strengthening the methodology of ranking can serve as a tool for reform for PTIs.

g) Accreditation of Outlying Units of BPR&D by Capacity Building Commission

Accreditation of the outlying units of BPR&D by the Capacity Building Commission provides an institutional framework for standardising training processes, infrastructure, internal governance, methodology, and perspective planning. By operationalising the criteria under the National Civil Services Training Institutions (NCSTI) framework, a common set of metrics and uniform assessment criteria, accreditation becomes instrumental in benchmarking each outlying unit against defined standards. This process also encourages data-based self-assessment, gap identification, and preparation of targeted capacity building plans, which ascertain accreditation as a tool of continuous improvement. All the outlying Units of BPR&D have been accredited by CBC and have been awarded between 'Ati Uttam (Two Stars)' and 'Utkrisht (Three Stars)' based on their assessment.

h) National Training Portal (under progress)

BPR&D is playing an instrumental role in promoting the standardization of police training in India through the development of the National Training Portal (NTP). The NTP has been envisaged as a digital platform to facilitate the sharing of training resources, curriculum, study materials, trainers, best practices and training calendars among all PTIs across the country. The NTP seeks to reduce disparities in training quality by providing uniform access to the Portal. The NTP will also offer upskilling and continuous professional development through online courses and sharing of knowledge repositories, thereby ensuring consistency in police competencies.

COMPARATIVE GLOBAL BEST PRACTICES IN POLICE TRAINING: STANDARDISATION AND BENCHMARKING

a. United States - The US regulates police training through state-level Peace Officer Standards and Training (POST) commissions, which mandate minimum certification requirements typically predefined (400 to 1,000 training hours) across all jurisdictions. The FBI National Academy at Quantico provides a residential programme for mid-career and senior officers, exercising a significant impact on a nationally uniform training culture. The Police Executive Research Forum (PERF) is another premier private organisation which develops standard SOPs, training manuals, methods, curricula on community policing, use of force, de-escalation, and various aspects of countering crimes. The POST model exemplifies that a federal polity can

enforce mandatory minimum certification standards without centralising the training delivery functions.

b. **United Kingdom** - Established in 2012, the College of Policing serves as a statutory professional body for policing in England and Wales. It is responsible for setting practice standards and overseeing training quality. Its Policing Education Qualifications Framework (PEQF), introduced in 2020, mandates degree-level qualifications for all new officers. The College's Authorised Professional Practice (APP) guide, publicly available and research-based, establishes transparent, evidence-based standards across every domain of policing. The College of Policing model offers a blueprint for a national-level statutory body with the mandate to enforce training standards, establish curriculum frameworks, and promote evidence-based practice.

c. **Singapore-** The Home Team Academy (HTA) offers integrated training for police, immigration, prisons, civil defence, and narcotics and promotes inter-agency coordination. The HTA's simulation infrastructure, including an urban simulation village, VR scenarios, and forensic laboratories, follows training in competency-based assessment, with performance-based progression. The curriculum is updated by continuous feedback and mapping the training outcomes.

d. **Australia-** State and territory police services maintain separate academies, coordinated at the command level by the Australian Institute of Police Management (AIPM). Training is aligned with the National Qualifications Framework (AQF), formally integrating police training with the civilian education system. Research based evidence in criminology is translated into practice of training by university collaborations with the Australian National University and Charles Sturt University. AQF demonstrates how police training can be benchmarked against national education standards, enabling lateral entry pathways.

DISCUSSION

The intersection of rapid urban transformation with the systemic standardisation of Police Training Institutions represents an important strategic juncture for India's policing and internal security. The realities of emerging urbanisation trends demonstrate that modern urban spaces are not merely expanded geographical jurisdiction, but a unique ecosystem characterized by hyper-connectivity, marked socio-economic stratification, and integration of digital and physical infrastructures. However, the analysis presents insights with important policy implications.

The first insight highlights the fundamental issue between standardisation at the national level and constitutional federalism. BPR&D's initiatives, such as model syllabi and ranking frameworks, however meticulously designed, may not persuade adoption by States. Effective standardisation in the Indian context requires the development of incentive provisions like financial incentives, peer learning avenues, and benefits of career development for officers from States/UTs to meet the desired training objectives.

The second insight highlights the urgency of quality improvement of trainers as a priority. The infrastructural development shall yield limited returns if the trainers lack pedagogical competence

and professional skills. The key takeaways from the four international examples point to the professionalisation of training faculty. The College of Policing's qualification framework, the FBI National Academy's FDP, and Singapore's HTA's integration of stakeholders reflect that the training quality enhancement is primarily a human capital challenge. BPR&D's National Pool of Master Trainers is a salient initiative, but its scale will have to match the magnitude of the challenge.

The third insight relates to the role of technology in addressing the training disparities. The geographic, topographical, and financial constraints pose a challenge for all PTIs to reach uniform physical infrastructure standards. However, in this scenario, the digital training platforms offer the possibility of expanding access to the training content without an expensive physical infrastructure investment in every PTI. The operationalisation of i-got, a national e-learning platform accessible to trainees and officers across the country, could become a revolution in capacity building by promoting high-quality content and self-paced learning. Additionally, the CoEs with advanced facilities may serve as a one-stop solution to the policing challenges of the client forces.

The fourth insight demonstrates the accountability mechanisms. The PTI ranking and Police Colours award may serve as instruments of accountability, but their effectiveness depends on linking their performance to higher benefits for PTIs, including centrally sponsored training modernisation funds.

Finally, the analysis argues for the integration of training reform within the process of broader urbanisation trajectory. To propel the training improvement, the other administrative aspects like recruitment, promotion, posting, and accountability mechanisms must be linked to competence based on emerging requirements of Policing and Internal Security.

Recommendations and Vision 2047 Roadmap

The roadmap for the standardisation of police training in India by 2047 rests on five pillars: governance, curriculum & methodology, trainer and human capital, infrastructure & technology, and a prudent financial architecture aligned with the aspiration of Viksit Bharat.

Institutional standardisation and governance

- Strengthen the mandate of BPR&D as the national standards and accreditation body for police training.
- Create a committee on Police Training Standards under BPR&D with representation from States, CAPFs, PTIs, Academia and Industry.
- Periodic grading of PTIs linked to infrastructure, faculty, curriculum and digital initiatives.

Capacity building and infrastructure

- Police Training Infrastructure Modernisation Scheme aligned with priority for PTIs that show major infrastructure inadequacies.
- Encourage States/UTs/CAPFs/CPOs to earmark a fixed portion of police budgets for training and tie central assistance to the gaps.
- Link PTI upgradation with investment in forensic and digital initiatives.

Digital, AI-enabled, and simulation-based training

- Expand the use of i-GOT Karmayogi.
- Simulation-based training for incident response, crowd management, cybercrime response, crisis management, counter- terrorism through centres of excellence.
- Blended learning through classroom teaching, e-learning and field- based training

Faculty development and master trainer systems

- Faculty Development Programme for PTIs at regular intervals.
- National master trainer pool focused on emerging crimes and salient domains like cyber-crime, crimes against women and children, urban policing, critical Infrastructure protection, community policing, health & well-being, and leadership, etc.
- Incentives and career advancements for high-performing trainers, including recognition and allowances.

National-level accreditation, ranking, and quality assurance

- Publication of Annual PTI ranking evaluation and assessment.
- Establish a national body to review courses & methodologies, compliance, and document best practices.

Integration with Vision 2047

- Align with Vision 2047 priorities such as SMART Policing.
- Promote partnerships between PTIs and industry for a holistic exchange of resources.
- Competency-based assessments linked to promotion of police personnel.

CONCLUSION

The standardisation of Police Training Institutions in India is a basic precondition for the professionalisation of policing as a public institution. This paper has outlined the various priority areas compelled by the existing and prospective urbanisation and the corresponding upgradation of the police training ecosystem. The policy initiatives undertaken by BPR&D like standardisation of syllabi, PTI rankings, Centres of Excellence, President's Police Colours awards, National Pool of Master Trainers and Accreditation of its outlying units and the development of the National Training Portal represent a crucial step towards standardisation of police training in India. Since the jurisdiction of BPR&D is advisory rather than mandatory to the States/UTs, it becomes a challenge to sustain a uniform reform momentum across the complex federal policing architecture. However, the States/UTs, while asserting their unique demands, have also aligned with the BPR&D's role in steering the upgradation and standardisation of police training in India.

The comparative analysis of global training systems reveals several doctrinal principles, including independent accreditation mechanisms, faculty development, digital training and the importance of integrated platforms for a holistic outcome.

The roadmap proposed in this paper, though indicative, stipulates a framework for achieving meaningful standardisation by 2047. This aligns with the Government of India's Viksit Bharat vision for world-class public institutions. The pathways to standardisation of the training ecosystem will lead to a major strategic investment in building a professional, trained, and resilient police force to meet future challenges.

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From CCTNS to Predictive and Precision Policing: GeoShield as an Indigenous GIS-Based Intelligence Platform for Precision Policing in India



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ABSTRACT

The Crime and Criminal Tracking Network & Systems (CCTNS) represents one of the most significant digital policing initiatives undertaken in India, creating a unified national repository of crime and criminal records. While the system has substantially improved record management, information sharing, and inter-state coordination, its operational utility has largely remained confined to transactional data management, with limited capability for spatial analysis, environmental correlation, or predictive intelligence (Bureau of Police Research and Development [BPR&D], n.d.; National Crime Records Bureau [NCRB], various years). This paper presents the development and implementation of GeoShield, an indigenous Geographic Information Systems (GIS)-based intelligence platform designed to transform CCTNS from a static crime-recording database into a dynamic decision-support system for predictive and precision policing. Using the Gautam Buddha Nagar Police Commissionerate as a case study, the paper demonstrates how the integration of geospatial analytics, hotspot clustering, temporal crime analysis, and multi-layered environmental data fusion can significantly enhance preventive policing, optimise police resource deployment, and improve operational efficiency. The study situates GeoShield within the broader framework of intelligence-led policing and evidence-based policing, demonstrating that existing national digital infrastructure can be leveraged to develop scalable, cost-effective, and operationally relevant predictive policing capabilities for India (Ratcliffe, 2016, Ch. 1; Sherman, 1995, pp. 35–52).

Keywords: *CCTNS; Geographic Information Systems (GIS); Predictive Policing; Intelligence-Led Policing; Hotspot Policing; GeoShield; Precision Policing; Crime Mapping; Evidence-Based Policing; India*

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1. INTRODUCTION

The evolution of contemporary policing has been characterised by a gradual transition from reactive law enforcement towards proactive, intelligence-led, and evidence-based policing. Increasingly, police organisations across the world rely on data analytics, geospatial technologies, crime mapping, and predictive modelling to anticipate criminal activity, optimise operational deployment, and improve public safety outcomes (Goldstein, 1979, pp. 236–258; Ratcliffe, 2016, Ch. 1).

This paradigm recognises that effective policing extends beyond responding to criminal incidents and instead seeks to prevent crime through informed, timely, and evidence-driven interventions (Sherman, 1995, pp. 35–52).

In India, the implementation of the Crime and Criminal Tracking Network & Systems (CCTNS) has constituted a major milestone in the digital transformation of policing. Developed under the National e-Governance Plan, CCTNS has enabled the digitisation of First Information Reports (FIRs), investigation records, criminal histories, and police station workflows across the country, thereby creating one of the world's largest integrated policing databases (BPR&D, n.d.; NCRB, various years). The platform has substantially improved record management, information accessibility, and inter-jurisdictional coordination among police agencies.

Despite these significant achievements, the operational utility of CCTNS has largely remained administrative rather than analytical. The platform has been designed primarily to record crime events rather than interpret them. Consequently, it provides limited capability to answer several operationally critical questions, including:

- Where are crimes spatially concentrating within urban environments?
- What environmental and socio-economic characteristics influence crime concentration?
- How do temporal variations affect patterns of crime recurrence?
- How can police resources be deployed proactively to prevent crime rather than merely respond to incidents after their occurrence?

Furthermore, several operational datasets—including emergency response (Dial-112) records, CCTV infrastructure, traffic movement, urban planning information, demographic characteristics, commercial activity, and public infrastructure—continue to exist in institutional silos. The absence of integration across these datasets limits the ability of police organisations to convert available information into actionable operational intelligence (Ratcliffe, 2016, Chs. 3–6).

Recognising these limitations, GeoShield was conceptualised and implemented as an indigenous GIS-based intelligence platform designed to augment the analytical capabilities of CCTNS. Rather than replacing the existing national digital policing infrastructure, GeoShield functions as an intelligence layer that transforms routine crime records into spatially enabled operational intelligence through geospatial analytics, hotspot detection, environmental correlation, and predictive deployment models. In doing so, it facilitates a transition from reactive policing towards precision policing, where preventive interventions are guided by evidence, location-specific

risk assessment, and real-time spatial intelligence (Ratcliffe, 2016; Sherman, 1995; College of Policing, n.d.).

2. NEED FOR THE STUDY: LIMITATIONS OF TRANSACTIONAL POLICING SYSTEMS

While the Crime and Criminal Tracking Network & Systems (CCTNS) has significantly strengthened the digital foundation of policing in India, its current design primarily supports information storage, retrieval, and administrative workflow management. The transition from digitised record management to intelligence-led policing requires analytical capabilities that can identify patterns, predict risks, and support operational decision-making (Ratcliffe, 2016).

Modern policing increasingly recognises that crime is not randomly distributed but is concentrated in specific locations, time periods, and environmental contexts. The ability to identify these concentrations and intervene proactively forms the foundation of hotspot policing, problem-oriented policing, and evidence-based policing approaches (Sherman, 1995; Goldstein, 1979; Eck et al., 2005).

Despite the availability of extensive digital crime records, several structural limitations restrict the transformation of transactional policing databases into intelligence platforms.

2.1 Reactive Nature of Crime Analysis

Traditional crime-recording systems are primarily designed to document incidents after their occurrence. While such records are essential for investigation, prosecution, and statistical reporting, they provide limited support for anticipating future crime patterns.

Reactive analysis focuses primarily on questions such as *what crime occurred, where it occurred, and who was involved*. Predictive and preventive policing requires additional analytical capabilities that address *why crime occurs at particular places and times and how police resources can intervene before recurrence* (Ratcliffe, 2016).

Problem-oriented policing literature emphasises that effective policing requires moving beyond incident-based responses towards understanding underlying conditions that generate recurring crime problems (Goldstein, 1979).

2.2 Lack of Spatial Intelligence

Crime has a strong spatial dimension. Research in environmental criminology has consistently demonstrated that criminal activity is unevenly distributed, with a small number of locations accounting for a disproportionate share of offences (Sherman, 1995; Eck et al., 2005).

However, conventional crime databases generally represent incidents through administrative classifications such as police stations, districts, or jurisdictional boundaries. These administrative units may conceal micro-level variations in crime concentration.

Without accurate spatial analysis, police organisations face difficulty in identifying:

- recurring crime locations;
- emerging hotspots;

- vulnerable public spaces;
- high-risk coordinates requiring targeted intervention.

Geographic Information Systems (GIS) provide the capability to transform crime records into spatial intelligence by identifying patterns that may remain invisible through conventional statistical reporting (Eck et al., 2005).

2.3 Data Silos and Limited Integration

Modern policing generates and receives information from multiple sources, including emergency response systems, surveillance networks, traffic systems, demographic databases, and urban infrastructure platforms.

However, these datasets often operate independently, limiting the ability to develop a comprehensive operational picture.

Intelligence-led policing emphasises the importance of integrating diverse information sources to generate actionable intelligence rather than merely collecting data (Ratcliffe, 2016).

The absence of structured integration between crime records and complementary datasets reduces the ability of police organisations to:

- validate crime patterns;
- understand contextual risk factors;
- optimise deployment strategies;
- measure effectiveness of interventions.

GeoShield addresses this limitation by integrating crime records with multiple spatial and environmental datasets to generate a comprehensive intelligence framework.

2.4 Absence of Environmental Context

Crime does not occur independently of its physical and social environment. Environmental criminology has established that opportunities for crime are shaped by routine activities, environmental design, accessibility, visibility, and the presence or absence of capable guardianship (Felson, 1998; Clarke, 1997).

Traditional crime databases generally capture the incident itself but provide limited information regarding the surrounding environment in which the incident occurred.

For example, a concentration of offences may be associated with:

- poorly illuminated roads;
- isolated parking areas;
- transport nodes;
- commercial clusters;
- areas with high pedestrian movement.

Understanding these contextual factors enables police organisations to move from generalized deployment strategies towards targeted preventive interventions based on place-specific risk assessment (Clarke, 1997; ISO 22341:2021).

2.5 Inefficient Resource Deployment

Police resources are limited, and their effective deployment requires scientific prioritisation. Conventional deployment models often rely heavily on operational experience, historical practices, and broad jurisdictional assessments.

While professional experience remains valuable, evidence-based policing advocates supplementing human judgement with systematic analysis of crime patterns and risk indicators (Ratcliffe, 2016).

Predictive deployment models allow police organisations to position resources according to:

- crime concentration;
- temporal patterns;
- emergency demand;
- environmental vulnerabilities.

This enables a transition from uniform deployment to precision deployment, ensuring that police presence is concentrated where it is most likely to prevent crime.

2.6 Inadequate Micro-Level Analysis

Most conventional crime analyses are conducted at police station, district, or administrative levels. Although useful for strategic planning, such aggregation can conceal significant variations within smaller geographical areas.

Research on crime hotspots demonstrates that crime concentration often exists at very small spatial units, including streets, intersections, and specific locations (Sherman, 1995; Eck et al., 2005).

Therefore, effective preventive policing requires analytical frameworks capable of examining crime patterns at a finer spatial resolution.

GeoShield addresses this requirement through a hexagonal grid-based spatial framework, enabling micro-level identification of crime concentration areas and supporting precision deployment.

2.7 Need for an Intelligence Layer over Existing Digital Infrastructure

The limitations discussed above indicate that the future of digital policing does not necessarily require replacement of existing databases but rather enhancement through analytical intelligence layers.

CCTNS provides the essential foundation of digitised crime information. However, converting this information into operational intelligence requires integration with GIS, temporal analysis, environmental datasets, and predictive tools (Ratcliffe, 2016).

GeoShield has been developed in response to this requirement by transforming existing crime data infrastructure into a dynamic platform capable of supporting preventive, evidence-based, and precision policing.

3. REVIEW OF INTERNATIONAL PRACTICES IN INTELLIGENCE-LED POLICING

The emergence of intelligence-led policing (ILP) and evidence-based policing has transformed the

manner in which police organisations analyse crime, allocate resources, and design preventive interventions. Rather than relying solely on traditional reactive approaches, contemporary policing models increasingly emphasise the systematic use of information, analysis, and evaluation to support operational decision-making (Ratcliffe, 2016).

A central principle underlying these approaches is that crime is not uniformly distributed across locations or time periods. Research has consistently demonstrated that crime tends to cluster in specific geographical areas and that targeted interventions at high-risk locations can produce measurable preventive benefits (Sherman, 1995; Eck et al., 2005).

International experiences provide important lessons regarding the use of data analytics, geographic information systems, and structured accountability mechanisms for improving policing outcomes.

3.1 CompStat – New York Police Department

The CompStat model introduced by the New York Police Department represents one of the earliest and most influential examples of data-driven policing. Developed during the 1990s, CompStat integrated crime statistics, geographic analysis, operational accountability, and managerial review mechanisms into a unified crime management framework.

The model enabled police commanders to identify emerging crime patterns, analyse geographical concentrations, and develop targeted responses. Its significance was not merely technological but organisational, as it institutionalised regular review of crime trends and created accountability for commanders responsible for specific operational areas (Ratcliffe, 2016).

The key principles emerging from the CompStat experience include:

- systematic collection and analysis of crime data;
- identification of geographic crime concentrations;
- rapid deployment of resources;
- continuous evaluation of operational outcomes.

These principles have influenced subsequent models of intelligence-led and evidence-based policing worldwide.

3.2 Metropolitan Police Service, London

The Metropolitan Police Service has incorporated geospatial crime analysis and hotspot policing approaches to support operational planning and resource allocation.

The application of crime mapping enables identification of repeat victimisation areas, emerging crime clusters, and locations requiring focused intervention. Such approaches are consistent with research demonstrating that crime prevention efforts are often most effective when directed towards specific places rather than broadly distributed across entire jurisdictions (Eck et al., 2005).

The experience of London demonstrates the importance of combining analytical capability with operational decision-making. GIS-based intelligence is most effective when integrated into routine policing processes rather than being treated as a separate analytical activity.

3.3 Singapore Police Force

The Singapore Police Force represents another example of technology-enabled proactive policing. Singapore has integrated surveillance infrastructure, information systems, and analytical capabilities to support situational awareness and preventive policing.

In high-density urban environments, where population movement and infrastructure complexity create dynamic security challenges, data-driven approaches enable more efficient allocation of police resources and faster operational response (UNODC, 2010).

The Singapore experience highlights the importance of:

- integrated information systems;
- technology-enabled monitoring;
- rapid response capability;
- continuous refinement of operational strategies.

3.4 Key Lessons from Global Experience

International experiences demonstrate several common principles that underpin successful intelligence-led policing models.

i. Crime is Concentrated in Space and Time

Extensive criminological research has established that crime is not evenly distributed across geographical areas. A relatively small number of locations often account for a disproportionate number of incidents (Sherman, 1995; Eck et al., 2005).

This principle provides the theoretical foundation for hotspot policing, where resources are concentrated at locations with elevated crime risk.

ii. Environmental Conditions Influence Crime Patterns

Environmental criminology demonstrates that crime opportunities are influenced by the interaction between offenders, victims, and places. Routine activity theory and situational crime prevention emphasise that environmental characteristics can either increase or reduce opportunities for offending (Felson, 1998; Clarke, 1997).

Consequently, effective crime prevention requires analysis not only of criminal incidents but also of the physical and social environments surrounding those incidents.

iii. Data-Driven Deployment Improves Efficiency

Evidence-based policing emphasises that operational decisions should be informed by systematic analysis rather than relying exclusively on traditional practices or individual experience (Sherman, 1995; Ratcliffe, 2016).

Predictive and precision policing models seek to enhance, rather than replace, professional judgement by providing commanders with timely and location-specific intelligence.

3.5 Relevance for the Indian Context

While international systems have demonstrated the effectiveness of intelligence-led policing, many rely on dedicated technological ecosystems and significant institutional investment.

The Indian policing environment presents unique requirements:

- large geographical scale;
- diverse socio-economic conditions;
- variation in policing resources;
- need for cost-effective and scalable solutions.

Therefore, a suitable Indian model must leverage existing public digital infrastructure while adding analytical capabilities.

GeoShield has been conceptualised within this framework. Instead of replacing CCTNS, it functions as an intelligence layer that enhances existing crime databases through GIS-based analysis, spatial clustering, environmental correlation, and operational decision support.

This approach aligns with the broader philosophy of intelligence-led policing by converting available information into actionable intelligence while ensuring scalability across police organisations (Ratcliffe, 2016).

4. GEOSHIELD: CONCEPT AND SYSTEM ARCHITECTURE

The development of GeoShield is based on the premise that the true value of digital policing infrastructure lies not merely in the collection and storage of information but in the ability to transform data into actionable operational intelligence. Contemporary intelligence-led policing frameworks emphasise that information becomes valuable when it supports timely decision-making, resource prioritisation, and preventive intervention (Ratcliffe, 2016).

GeoShield has been developed as an indigenous Geographic Information Systems (GIS)-based intelligence platform designed to augment the analytical capabilities of the Crime and Criminal Tracking Network & Systems (CCTNS). The platform seeks to transform routine crime records into a dynamic decision-support system capable of supporting predictive and precision policing.

Unlike conventional crime databases that primarily answer descriptive questions relating to past incidents, GeoShield enables police leadership to analyse:

- where crimes are occurring;
- how crime patterns are changing spatially and temporally;
- which locations demonstrate elevated risk;
- what environmental factors contribute to vulnerability; and
- where preventive resources should be deployed.

The conceptual foundation of GeoShield is derived from principles of intelligence-led policing, hotspot policing, and evidence-based policing, where analytical insights guide operational decision-making (Sherman, 1995; Ratcliffe, 2016).

The platform is built around three interconnected capabilities:

1. Geospatial Crime Mapping

2. Hotspot Detection and Spatial Clustering
3. Multi-layer Data Fusion for Predictive Analysis

Together, these capabilities enable a transition from traditional incident-based policing towards location-specific, evidence-driven preventive policing.

4.1 Geospatial Crime Mapping

The first capability of GeoShield involves converting conventional crime records into spatially enabled intelligence.

Crime incidents extracted from CCTNS are processed, standardised, and geo-referenced before being represented through GIS-based visualisation. This enables police commanders and field officers to examine crime distribution patterns across geographical areas.

Crime mapping has been recognised as a critical component of modern policing because it allows analysts to identify concentrations of criminal activity that may remain hidden within conventional statistical reports (Eck et al., 2005).

Through spatial visualisation, GeoShield enables:

- identification of recurring crime locations;
- comparison of crime patterns across areas;
- detection of emerging risk zones;
- assessment of deployment effectiveness.

4.2 Hotspot Detection and Spatial Clustering

A central feature of GeoShield is the identification of crime hotspots through spatial clustering.

The concept of hotspot policing is based on extensive criminological research demonstrating that crime is highly concentrated at specific places and that targeted interventions at these locations can produce significant preventive outcomes (Sherman, 1995).

GeoShield aggregates crime incidents spatially to identify areas where:

- crime frequency is elevated;
- particular offences repeatedly occur;
- temporal patterns indicate increased vulnerability.

The dynamic identification of hotspots enables police units to shift from generalized patrolling towards targeted deployment.

Such an approach supports the principles of evidence-based policing by ensuring that operational resources are directed towards objectively identified areas of risk rather than solely relying on historical experience or administrative boundaries (Sherman, 1995; Eck et al., 2005).

4.3 Multi-layer Data Fusion for Predictive Analysis

A distinguishing feature of GeoShield is its ability to integrate crime data with multiple environmental and operational datasets.

Crime occurrence is influenced by complex interactions between offenders, victims, routine activities, and environmental conditions. Therefore, understanding crime requires analysis beyond the incident itself (Felson, 1998; Clarke, 1997).

GeoShield incorporates multiple layers of information to create a comprehensive operational intelligence framework.

These layers include:

- CCTNS FIR and crime records;
- emergency response data (112 calls);
- CCTV and surveillance infrastructure;
- road networks and transportation corridors;
- commercial establishments;
- demographic characteristics;
- urban infrastructure indicators;
- night-time activity patterns.

The integration of these datasets enables police organisations to examine the relationship between crime patterns and environmental characteristics.

5. METHODOLOGY: GIS FRAMEWORK AND HEXAGONAL GRID SYSTEM

5.1 Transition from Administrative Boundaries to Spatial Grids

Traditional policing systems generally rely upon administrative boundaries such as police stations, sectors, or districts for planning and analysis.

While these boundaries are operationally necessary, they may not accurately represent the spatial distribution of crime. A police station jurisdiction may contain both high-risk and low-risk locations, thereby masking important variations within the area.

Research in crime mapping demonstrates that micro-level spatial analysis provides a more accurate understanding of crime concentration and enables more focused preventive strategies (Eck et al., 2005).

To overcome this limitation, GeoShield adopts a uniform spatial grid-based analytical framework.

The city is divided into 700 × 700 metre hexagonal grids, allowing crime incidents to be analysed through standardised spatial units rather than administrative divisions.

5.2 Rationale for Hexagonal Grid Analysis

Hexagonal spatial analysis provides several advantages compared with traditional square grid systems.

Hexagonal grids offer:

- more uniform neighbourhood relationships;
- reduced directional bias;
- improved spatial continuity;
- greater efficiency in proximity analysis.

Because each hexagonal cell has six equally connected neighbouring cells, it provides a more natural representation of spatial relationships compared with square grids, where corner distances differ from adjacent distances.

The use of spatial tessellation supports more precise identification of crime concentration patterns and improves the analytical resolution of hotspot detection.

5.3 Hotspot Identification Framework

Within each hexagonal cell, crime incidents are aggregated and analysed to identify areas demonstrating elevated crime activity.

The system allows dynamic updating of hotspot information as new incidents are recorded, thereby supporting continuous situational awareness.

This approach is consistent with hotspot policing research, which demonstrates that focusing police attention on specific high-risk locations can produce effective crime prevention outcomes (Sherman, 1995).

5.4 Temporal Crime Analysis

Spatial analysis alone is insufficient for predictive policing. Crime patterns also demonstrate temporal variation.

GeoShield incorporates temporal analysis to examine:

- peak crime hours;
- day-wise variations;
- seasonal patterns;
- recurring temporal concentrations.

Understanding when crime risk increases enables police commanders to align deployment strategies with periods of elevated vulnerability.

This integration of spatial and temporal intelligence represents a movement from retrospective crime analysis towards anticipatory policing.

6. MULTI-LAYER DATA INTEGRATION AND ENVIRONMENTAL CORRELATION

A fundamental principle of contemporary crime analysis is that criminal activity cannot be understood solely through examination of incident records. Crime occurs within specific physical, social, and environmental contexts, and these contextual factors influence opportunities for offending, victimisation patterns, and the effectiveness of preventive interventions (Felson, 1998; Clarke, 1997).

Traditional crime databases generally provide information about the incident itself, including offence type, location, and time. However, they often provide limited insight into the surrounding conditions that may contribute to crime concentration.

GeoShield addresses this limitation by adopting a multi-layer GIS framework that combines crime information with environmental, infrastructural, and operational datasets. This approach enables the creation of a more comprehensive intelligence picture of crime risk.

6.1 Integrated Data Layers

GeoShield integrates multiple datasets to strengthen spatial understanding and operational decision-making.

The major integrated layers include:

i. CCTNS FIR and Crime Records

CCTNS serves as the foundational crime database for GeoShield. FIR details and incident records provide information regarding:

- nature of offence;
- location of occurrence;
- temporal characteristics;
- crime trends.

The transformation of these records into spatial intelligence enables analysis beyond conventional administrative reporting (BPR&D, n.d.; NCRB, various years).

ii. Emergency Response Data (112 Calls)

Integration with emergency response data enhances situational awareness by incorporating real-time public distress information.

Emergency calls provide additional indicators regarding:

- demand patterns;
- vulnerable locations;
- response requirements;
- emerging risk areas.

This complements registered crime data by providing a broader operational picture.

iii. CCTV and Surveillance Infrastructure

The spatial distribution of surveillance infrastructure is incorporated to evaluate:

- existing monitoring capability;
- areas requiring additional coverage;
- relationship between surveillance presence and crime occurrence.

Such analysis supports evidence-based decisions regarding CCTV placement and optimisation.

iv. Road Networks and Transport Corridors

Mobility patterns influence crime opportunity structures. Roads, transport hubs, and movement corridors can affect accessibility, offender mobility, and victim exposure.

Integration of transport-related spatial information assists in identifying locations requiring enhanced patrol visibility and preventive measures.

v. Commercial Establishments and Economic Activity

Locations such as:

- banks;
- ATMs;
- markets;
- commercial centres;
- business districts

may demonstrate distinct risk profiles due to population movement, cash transactions, and increased public interaction.

GeoShield enables correlation between crime patterns and commercial activity zones to support targeted preventive strategies.

vi. Demographic and Urban Infrastructure Indicators

Population density, urban development patterns, lighting infrastructure, and public amenities influence crime opportunities.

Environmental criminology emphasises that crime prevention requires understanding the relationship between place characteristics and criminal opportunity (Clarke, 1997; Felson, 1998).

6.2 Environmental Crime Correlation

A major innovation of GeoShield is the integration of environmental intelligence into policing decisions.

The theoretical basis for this approach emerges from:

- Routine Activity Theory;
- Situational Crime Prevention;
- Crime Pattern Theory;
- Crime Prevention Through Environmental Design (CPTED).

These frameworks demonstrate that crime occurs when motivated offenders encounter suitable targets in environments where effective guardianship is insufficient (Felson, 1998; Clarke, 1997).

By overlaying crime incidents with environmental variables, GeoShield enables identification of contextual risk factors.

For example, spatial analysis may reveal crime concentration around:

- transport hubs;
- isolated parking areas;
- poorly illuminated roads;
- commercial banking clusters;
- locations with high night-time activity.

Such insights allow police organisations to develop targeted interventions, including:

- increased patrolling;
- infrastructure improvement recommendations;
- surveillance enhancement;
- community engagement initiatives.

This represents a shift from generic policing towards place-based preventive policing.

7. GEOSHIELD IN OPERATIONAL DESIGN

GeoShield has been designed not merely as an analytical visualisation platform but as an operational decision-support system integrated into routine policing processes.

The effectiveness of intelligence-led policing depends on the ability to convert analytical outputs into operational action. Data analysis must therefore be directly connected with command decisions, deployment planning, and field-level interventions (Ratcliffe, 2016).

7.1 Decision Support Dashboards

GeoShield provides customised dashboards for Station House Officers (SHOs), supervisory officers, and senior police leadership.

These dashboards enable officers to:

- identify active crime hotspots;
- monitor changing crime patterns;
- assess patrol coverage;
- review response effectiveness;
- plan preventive interventions.

By presenting complex spatial information in an operationally usable format, GeoShield supports faster and more informed decision-making.

7.2 Predictive Deployment Model

The central operational objective of GeoShield is to support predictive deployment.

Traditional deployment approaches often rely on historical experience and broad jurisdictional assessment. While field experience remains important, evidence-based policing recommends supplementing professional judgement with systematic analysis of crime patterns (Sherman, 1995; Ratcliffe, 2016).

GeoShield supports deployment planning for:

- Police Response Vehicles (PRVs);
- patrol units;
- static pickets;
- surveillance resources;
- community policing initiatives.

Deployment decisions are informed by:

- hotspot intensity;
- temporal crime patterns;
- emergency response demand;
- environmental vulnerability indicators.

This enables movement from reactive response towards preventive positioning of resources.

7.3 Feedback Loop Mechanism

An important feature of GeoShield is the incorporation of operational feedback from field officers.

Predictive and analytical systems require continuous refinement because crime patterns evolve over time. The involvement of field personnel ensures that analytical outputs remain connected with ground realities.

The feedback mechanism allows:

- validation of identified hotspots;
- refinement of risk indicators;
- improvement of deployment strategies;
- adaptation to changing crime patterns.

This creates a continuous intelligence cycle involving:

Data Collection → Analysis → Operational Deployment → Field Feedback → Model Refinement

Such an iterative approach reflects the core principles of intelligence-led policing, where intelligence generation and operational action function as interconnected processes (Ratcliffe, 2016).

8. LEVERAGING CCTNS: FROM DATABASE TO INTELLIGENCE LAYER

The Crime and Criminal Tracking Network & Systems (CCTNS) provides the foundational digital infrastructure upon which GeoShield has been developed. Since its implementation, CCTNS has significantly enhanced the capacity of police organisations to maintain digital crime records, access information, and facilitate coordination between police units across jurisdictions (BPR&D, n.d.; NCRB, various years).

However, the transformation of CCTNS from a record-management system into an intelligence platform requires additional analytical capabilities. Digital information, by itself, does not automatically generate intelligence. Intelligence emerges when information is systematically processed, analysed, interpreted, and converted into actionable knowledge for decision-making (Ratcliffe, 2016).

GeoShield addresses this requirement by creating an analytical layer over existing CCTNS infrastructure.

8.1 Data Extraction and Processing

The first stage in transforming CCTNS data into spatial intelligence involves systematic extraction, cleaning, and processing of crime information.

Crime records undergo multiple analytical steps, including:

- data standardisation;
- removal of inconsistencies;
- classification of crime categories;
- geographical referencing;
- spatial validation.

Accurate geo-referencing is essential because the effectiveness of GIS-based crime analysis depends upon the quality and precision of location data (Eck et al., 2005).

Through this process, conventional crime records are converted into spatially meaningful datasets suitable for hotspot analysis, temporal assessment, and operational planning.

8.2 API-Based Evolution

A significant future direction for GeoShield is direct API-based integration with CCTNS.

At present, many digital systems exchange information through periodic data transfer mechanisms. While such approaches provide analytical capability, real-time integration would substantially enhance operational responsiveness.

API-based connectivity would enable:

- continuous data synchronisation;
- faster identification of emerging hotspots;
- real-time operational dashboards;
- improved coordination between information systems.

Such evolution would strengthen the transition from periodic crime analysis towards continuous intelligence generation.

8.3 Integration with Emergency Response Systems

Integration of emergency response data represents an important enhancement to crime intelligence.

Registered crime data represents only one component of the public safety environment. Emergency calls provide additional information regarding incidents, public concerns, and locations requiring police attention.

By incorporating 112 emergency response data, GeoShield enhances situational awareness through:

- identification of demand concentrations;
- validation of crime patterns;
- assessment of response requirements;
- improved resource positioning.

This multi-source intelligence approach is consistent with international practices in intelligence-led policing, where diverse information streams are integrated to support operational decisions (Ratcliffe, 2016).

9. INSTITUTIONAL IMPLEMENTATION: GAUTAM BUDDHA NAGAR POLICE COMMISSIONERATE

GeoShield was implemented at the Gautam Buddha Nagar Police Commissionerate as a structured initiative to strengthen evidence-based and preventive policing.

The implementation represented not merely the introduction of a technological platform but an organisational transformation towards analytical decision-making.

Technology-driven policing initiatives succeed only when analytical tools are integrated into institutional processes and adopted by operational personnel. Organisational acceptance, training, and continuous engagement are therefore essential components of successful intelligence-led policing (Ratcliffe, 2016).

9.1 Training and Capacity Building

A major component of GeoShield implementation was the development of analytical capacity among police personnel.

Training initiatives focused on:

- familiarisation with GIS-based crime analysis;
- interpretation of hotspot information;
- use of dashboards for operational planning;
- integration of analytical insights into routine policing.

The objective was not to replace professional judgement but to enhance decision-making by providing scientifically derived information.

This approach reflects the principle of evidence-based policing, where data and analysis support, rather than substitute, police expertise (Sherman, 1995).

9.2 Operational Integration

GeoShield was integrated into multiple operational functions, including:

Patrol Planning

Spatial analysis assists in identifying locations requiring enhanced police presence and targeted patrolling.

Beat Allocation

Crime concentration patterns support rational allocation of beat responsibilities.

CCTV Placement Decisions

Environmental and crime analysis assist in identifying locations where surveillance infrastructure can provide maximum operational benefit.

Identification of High-Risk Coordinates

Micro-level spatial analysis enables identification of vulnerable locations requiring focused intervention.

Preventive Resource Deployment

The platform supports deployment of preventive resources based on evidence rather than broad assumptions.

9.3 Organisational Adoption

A key factor contributing to the effectiveness of GeoShield has been institutional ownership and continuous operational feedback.

Analytical systems are most effective when they become embedded within routine decision-making processes rather than functioning as independent technological tools.

The development of GeoShield involved continuous interaction with field officers to ensure:

- usability;
- operational relevance;
- practical applicability;
- alignment with policing requirements.

This participatory approach strengthened organisational acceptance and facilitated the transition towards data-driven policing practices.

10. OPERATIONAL OUTCOMES: EXPERIENCE OF GAUTAM BUDDHA NAGAR POLICE COMMISSIONERATE

The implementation of GeoShield at the Gautam Buddha Nagar Police Commissionerate demonstrates the practical application of GIS-based intelligence in preventive policing, operational efficiency, and resource optimisation.

The platform has supported a transition from reactive incident response towards evidence-based deployment by enabling police leadership to identify spatial crime patterns, anticipate vulnerabilities, and allocate resources more strategically.

It is important to recognise that crime outcomes are influenced by multiple administrative, social, and policing interventions. Therefore, the results presented below indicate operational association with GeoShield-enabled interventions rather than claiming exclusive causal attribution.

10.1 Preventive and Disruptive Impact

GeoShield-based interventions have contributed to:

- reduction of repeat incidents in identified hotspot locations;
- disruption of persistent temporal patterns of crime;

- improved targeting of police deployment;
- enhanced supervisory monitoring and accountability.

The identification of persistent crime locations enabled focused preventive action rather than uniform deployment across large geographical jurisdictions.

This approach is consistent with the findings of hotspot policing research, which demonstrates that concentrated attention towards high-risk places can produce measurable preventive benefits (Sherman, 1995; Eck et al., 2005).

By identifying vulnerable coordinates and enabling targeted intervention, GeoShield supports a transition from reactive policing towards place-based crime prevention.

10.2 Improvement in Emergency Response

A significant operational improvement observed after the implementation of GeoShield relates to emergency response efficiency.

The average response time of Police Response Vehicles (PRVs) under the 112 emergency response system in Gautam Buddha Nagar improved from:

6 minutes 07 seconds (2022)

to:

3 minutes 45 seconds (current)

This performance placed Gautam Buddha Nagar at the first rank in the state in PRV response efficiency.

The improvement is attributable not only to enhanced mobility but also to improved positioning of response resources through spatial analysis and hotspot intelligence.

Predictive positioning enables police units to be located closer to areas with higher probability of demand, thereby reducing response delays and improving operational readiness.

10.3 Evidence-Based Enforcement Outcomes

GeoShield has strengthened enforcement efficiency by enabling targeted checking, surveillance planning, and intelligence-led operations.

Traditional enforcement models may involve broad-area checking based primarily on experience and routine practice. GeoShield enables a more scientific approach by directing attention towards:

- crime concentration zones;
- repeat incident locations;

- vulnerable time periods;
- environmental risk indicators.

This reflects the principles of evidence-based policing, where operational decisions are guided by systematic analysis of available information rather than relying exclusively on conventional approaches (Sherman, 1995; Ratcliffe, 2016).

10.4 Reduction in Major Crime Categories (2022–2025)

A comparative analysis of selected major crime categories indicates a downward trend in serious and property-related offences following the implementation of the GeoShield framework.

Table 1: Comparative Crime Analysis – Gautam Buddha Nagar Police Commissionerate

Crime Category	2022	2025	Change
Loot	39	6	↓ 85%
Theft	1,054	753	↓ 28%
Rape	29	7	↓ 76%
Murder	53	41	↓ 23%
Rioting	98	42	↓ 57%
Vehicle Theft	1,419	949	↓ 33%
Kidnapping	461	208	↓ 55%
Housebreaking	144	31	↓ 78%

The above comparison represents crime figures under similar categories for Gautam Buddha Nagar Police Commissionerate for the years 2022 and 2025. The analysis reflects the period before and after implementation of the GeoShield matrix.

Although multiple policing and administrative measures contribute to changes in crime trends, the structured hotspot-based deployment and spatial intelligence capabilities provided through GeoShield have strengthened preventive policing outcomes by enabling more focused interventions.

10.5 Three-Year Implementation Experience of GeoShield: From Concept to Operational Intelligence

The implementation of GeoShield at the Gautam Buddha Nagar Police Commissionerate represents a three-year journey of converting digital crime records into actionable operational intelligence. Unlike technology models developed solely in controlled research environments, GeoShield has evolved through continuous field application, operational feedback, and institutional adaptation.

The sustained implementation period demonstrated that predictive and precision policing requires more than technological capability. It requires integration of analytical tools into police processes, development of user confidence, and alignment between intelligence outputs and operational decision-making.

During this period, GeoShield facilitated:

- systematic identification of crime concentration areas;
- hotspot-based patrol planning;
- improved positioning of emergency response resources;
- targeted preventive interventions;
- enhanced supervisory monitoring;
- data-supported operational reviews.

The experience demonstrated that existing digital policing infrastructure such as CCTNS can be significantly enhanced through an analytical intelligence layer without requiring complete replacement of established systems.

A critical learning from the implementation was that technology adoption in policing depends upon institutional ownership. Continuous interaction with field officers ensured that GeoShield remained operationally relevant and evolved according to practical policing requirements.

The Gautam Buddha Nagar experience indicates that indigenous GIS-based intelligence platforms can provide a scalable pathway for Indian police organisations seeking to transition from reactive crime response towards proactive, evidence-based, and precision policing.

11. COMPARATIVE INTERNATIONAL CONTEXT REVISITED

The experience of GeoShield aligns with global developments in intelligence-led and evidence-based policing.

The CompStat model demonstrated the importance of combining crime statistics, geographic analysis, and managerial accountability to improve police performance (Ratcliffe, 2016).

Similarly, hotspot policing approaches adopted internationally have shown that crime prevention can be enhanced by directing resources towards locations with demonstrated risk concentration (Sherman, 1995; Eck et al., 2005).

The Metropolitan Police Service in London has utilised geospatial crime analysis to support operational planning and resource optimisation, while technology-enabled policing approaches in Singapore demonstrate the value of integrated information systems for proactive public safety management.

GeoShield shares these international principles but differs in its institutional context and architecture.

Unlike many proprietary international systems, GeoShield has been developed by leveraging existing national digital infrastructure, particularly CCTNS, and adding an indigenous GIS-based analytical layer.

This provides several advantages:

- scalability across Indian policing jurisdictions;
- lower implementation costs;
- integration with existing government systems;
- adaptability to local operational requirements.

Thus, GeoShield demonstrates that advanced intelligence-led policing capabilities can be developed within existing public digital infrastructure.

12. POLICY IMPLICATIONS AND NATIONAL REPLICABILITY

The GeoShield model has significant implications for police modernisation and digital transformation in India.

The experience demonstrates that the next stage of digital policing should focus not merely on digitisation of records but on converting information systems into intelligence platforms.

12.1 Leveraging Existing Infrastructure

CCTNS has already established a nationwide digital foundation for crime information management.

GeoShield demonstrates that additional analytical capability can be developed by building intelligence layers over existing infrastructure rather than creating entirely separate systems.

Such an approach provides a practical pathway for large-scale adoption.

12.2 Cost-Effective Modernisation

Many advanced policing technologies require substantial investment in proprietary platforms.

GeoShield presents an alternative model based on:

- existing government databases;
- GIS technology;
- analytical frameworks;
- indigenous development capability.

This makes the model particularly relevant for large and diverse policing environments such as India.

12.3 Standardisation of Intelligence-Led Policing

A national framework based on GeoShield principles could support standardisation of:

- hotspot analysis;

- spatial crime mapping;
- predictive deployment;
- operational dashboards;
- evidence-based decision-making.

Such standardisation would promote consistency while allowing adaptation according to local conditions.

12.4 Institutionalisation of Evidence-Based Policing

The broader significance of GeoShield lies in encouraging a cultural transition within policing—from experience-based decision-making alone towards decisions supported by evidence and analytics.

Technology does not replace police judgement; rather, it enhances human decision-making by providing timely, accurate, and actionable information (Ratcliffe, 2016).

13. FUTURE ROADMAP

GeoShield represents an evolving intelligence platform rather than a static technological intervention. As policing environments become increasingly complex, future development will require continuous refinement of analytical capability, data integration, and operational applicability.

The future roadmap for GeoShield includes the following areas:

13.1 Higher Spatial Resolution

The current hexagonal grid framework provides a structured approach for spatial analysis. Future development may involve a reduction in grid size to achieve higher spatial resolution while maintaining analytical reliability.

Improved spatial granularity can enable more precise identification of vulnerable locations and support micro-level preventive interventions.

13.2 Dynamic Hotspot Animation and Crime Displacement Analysis

Crime patterns are dynamic and may shift geographically in response to enforcement activity, environmental changes, or offender adaptation.

Future versions of GeoShield may incorporate dynamic hotspot animation to visualise:

- movement of crime concentrations;
- emergence of new vulnerable areas;
- displacement patterns following interventions.

Such capability would enable police organisations to continuously adapt operational strategies.

13.3 Integration of Crime Prevention Through Environmental Design (CPTED)

Environmental criminology demonstrates that modification of physical environments can reduce opportunities for crime (Clarke, 1997).

Future integration of CPTED principles may allow GeoShield to identify environmental vulnerabilities related to:

- lighting conditions;
- visibility;
- urban design;
- public space management;
- surveillance gaps.

This would expand the platform from crime analysis towards comprehensive crime prevention planning.

13.4 Artificial Intelligence and Machine Learning-Based Predictive Modelling

Future development may incorporate artificial intelligence and machine learning techniques to identify complex patterns within large-scale datasets.

Potential applications include:

- predictive risk scoring;
- anomaly detection;
- trend forecasting;
- automated pattern recognition.

However, such applications must incorporate principles of transparency, accountability, and human oversight to ensure that technology supports fair and responsible policing.

Predictive systems should function as decision-support tools rather than autonomous decision-making mechanisms.

13.5 Real-Time API Integration with CCTNS

Direct API-based integration with CCTNS would enable real-time information exchange and improve operational responsiveness.

Such integration would facilitate:

- immediate updating of crime intelligence;
- faster hotspot identification;
- improved coordination between police units;
- continuous situational awareness.

13.6 Expansion of Multi-Agency Data Integration

Future iterations may explore integration with additional public safety and urban management datasets, including:

- traffic systems;
- municipal infrastructure;
- emergency services;
- urban planning information;
- public safety initiatives.

Such multi-agency integration can contribute towards a broader smart governance ecosystem.

14. CONCLUSION

The transformation of policing in the digital era is defined not merely by the digitisation of records but by the ability to convert information into actionable intelligence.

The Crime and Criminal Tracking Network & Systems (CCTNS) has established a strong foundation for digital policing in India by creating a nationwide repository of crime and criminal records. However, the full operational potential of such infrastructure is realised only when combined with advanced analytical capabilities, geospatial intelligence, and evidence-based decision-support mechanisms.

GeoShield represents an indigenous effort to bridge this analytical gap by transforming CCTNS from a transactional database into a GIS-based intelligence platform for predictive and precision policing.

The experience of the Gautam Buddha Nagar Police Commissionerate demonstrates that spatial analysis, hotspot identification, and data-driven deployment can strengthen preventive policing, improve emergency response efficiency, and optimise utilisation of police resources.

The significance of GeoShield extends beyond technological innovation. Its primary contribution lies in demonstrating a practical model for institutional transformation—where existing digital infrastructure is enhanced through analytical intelligence to support proactive governance.

The future of policing lies not only in responding faster to crime but in anticipating risk, understanding vulnerability, and preventing incidents before they occur. In this framework, technology does not replace human judgement; it strengthens professional decision-making by providing timely, accurate, and operationally relevant intelligence (Ratcliffe, 2016).

GeoShield therefore represents a transition in policing philosophy—from reactive enforcement towards anticipatory and preventive governance. By combining indigenous innovation, existing national infrastructure, and global principles of intelligence-led policing, it provides a scalable model for the future of precision policing in India.

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Urban Policing for Viksit Bharat 2047: A Roadmap towards Ethical, Smart and Citizen-Centric Governance in India





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ABSTRACT

India's rapid urban expansion has brought forth new dimensions of governance, where maintaining public order must go hand in hand with responsiveness, inclusivity, and institutional accountability, connecting technology, public service delivery, and citizen engagement.

In reference to the national aspiration of Viksit Bharat 2047, this paper explores initiatives like Integrated Emergency Response Systems, data-driven policing practices, and smart city interventions; the use of AI, CCTV integration, drone systems, IoT, and other technological interventions; mega-city congestion, deep socio-economic divides, sophisticated cyber-physical crimes, and heightened public expectations for institutional accountability. However, the ethical considerations, besides capacity building, inter-agency coordination, and citizen-centric practices in the context of increased reliance on surveillance technologies and digital platforms, are equally important.

Keywords: *Viksit Bharat 2047; SMART Policing; Ethical Policing; Integrated Command and Control Centers, Technology in Policing; Commissionerate System, Public Trust; Emergency Response Systems; CCTV, Drones, AI, ICJS, CCTNS*

INTRODUCTION

The challenges of Urban policing have increased manifold with the increase of Cyber Crimes, unrest in society, radicalization, terrorist and extremist activities, Corporate frauds, Real Estate frauds, Hospital Frauds, e-ticket frauds, along with the youth unrest, protests, Gen-Z challenges, traffic, Drones, New Age crimes, data protection, organized crimes, migration, floods, public protests, social media monitoring etc.

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The increasing adoption of digital technologies has transformed policing practices by enhancing communication, surveillance, and service delivery mechanisms. CCTV, drone surveillance systems, AI tools, and integrated command and control centers have enhanced the operational capacity of police forces in urban areas and are effective for crime prevention and investigation. Dial 112 with GPS-enabled systems makes the response time very quick and effective. Senior officers can monitor the functioning of police stations online. Our cities are likely to confront complex policing concerns similar to those observed in other rapidly urbanizing societies.

REVIEW OF LITERATURE

Existing studies on urban policing in India have largely focused on police modernization, community policing, accountability, and the growing use of technology in crime prevention and public service delivery systems (Mohan, 2009; Verma, 2015; Meijer & Wessels, 2019), Criminal Justice system and the implications of digital governance initiatives such as CCTNS and ICJS (Ministry of Home Affairs, 2025) and recently on adoption of Nyaya Sanhitas. The present study explores how ethical values, smart technologies, and citizen-centric approaches can be integrated to develop a future-ready policing framework for Indian cities in line with Viksit Bharat 20247.

1. Emerging Challenges and Future Directions in Urban Policing

1.1 Urbanization and Changing Crime Patterns

Crime is generating more data than ever, and AI now drives predictive policing, fraud detection, and surveillance, though it cannot replace ethics and human judgment given the risk of bias. Corruption, human rights concerns, and public trust deficits persist with Police alongside broader threats: Northeast insurgency, cross-border terrorism in Kashmir, cybercrime, illegal immigration, and radicalization. Migration and criminal networks add further complexity to urban order.

SMART Policing and the Interoperable Criminal Justice System (ICJS) are pushing digital records, tech-assisted investigation, and coordination among police, courts, prisons, and forensic units, improving efficiency but requiring stricter rule of law, accountability, and data privacy safeguards. AI, autonomous systems, and drones will reshape both risks and opportunities, demanding officers skilled in digital evidence and AI-assisted forensics.

Fundamentalism and social media–driven cybercrime are growing, with criminals using SIM sandboxing and quantum computing to hide their identities. Expanding mega-regions and smart cities are straining housing and infrastructure, while inter-state water and border disputes risk law and order crises. Airports need heightened surveillance against bomb hoaxes and terrorist movement, and wearable devices are creating new evidence sources and new risks alike, calling for closer cooperation between police, Tech firms, and regulators.

Viksit Bharat's infrastructure push - bullet trains, metros, expanded rail network - will mean large-scale land acquisition and disputes with landowners. Rising migration adds pressure on basic needs in urban places but also creates slums and busy marketplaces. AI-driven policing will strengthen investigations and free personnel from routine work, but this must be matched by better workforce planning and continuous capacity building.

1.1.1. Environment-Friendly Police Infrastructure

Police departments should shift to electric vehicles with fast-charging infrastructure, and new stations should be built with sustainable, energy-efficient facilities using solar micro-grids and rainwater harvesting, remaining operational through infrastructure failures or disasters.

1.1.2. Police Image

By 2047, Indian policing needs a stronger global image, transparent and technology-driven, with little room for abuse. This image has improved through judicial intervention and citizen-friendly reforms, e-services, and awareness amongst the citizens. Urbanization keeps creating new criminal opportunities. Policing will increasingly rely on intelligence and technology over force.

1.2 Migration

Gig employment through ride-hailing platforms, food delivery, and hyperlocal commerce apps is growing fast among youth, cutting across state lines. Platform competition adds to traffic pressure and has drawn scrutiny over unrealistic delivery-time claims. With proper verification, gig workers could also serve as an intelligence resource for police.

As UPI and digital payments grow, body-embedded chips may eventually replace physical devices for payment, identity, and communication tools. Financial fraud is evolving as fast as the technology meant to catch it, demanding continuous relearning by police. Drones are becoming key tools for logistics and healthcare delivery, making drone traffic management a security domain of its own. Urbanization also raises vulnerability to disasters and biological threats like COVID-19, and as machines themselves become capable of committing crime, the line between human- and machine-enabled offences is blurring, demanding a new approach to urban policing.

1.3 Internet of Things

Interconnected devices raise new data and forensic questions. Self-driving cars, smart watches, and household electronics can all be hijacked, and as smart watches replace TVs and phones, they've created a new field like smart watch forensics, one of many such frontiers to come. Competition for rare earth materials may soon rival that for gold and silver, and hacking critical infrastructure like nuclear reactors is a growing threat, much like today's corporate cyberattacks.

1.4 AI in Policing

AI's growing role widens the attack surface for criminals, who may hack AI systems or use fake AI personas to extract classified information. Drones may replace beat patrolling and be dispatched ahead of Quick Reaction Teams (QRT) or 112 vehicles for emergency assessment. AI will increasingly drive crime mapping, hotspot analysis, and predictive policing, while blockchain preserves data sovereignty and AI-integrated drones serve as rapid responders in inaccessible areas. However, Algorithmic Bias Audits must be in place, where Public-private panels of data ethicists, legal scholars, and technologists should audit police software biannually to prevent AI systems from reinforcing bias or profiling marginalized communities.

Police now trace suspects via ISP/telecom GPS data, though VPNs allow IP masking and sensors can independently detect movement. E-complaints and eased court attendance are reducing the burden on victims. Effective policing depends on scientific investigation rather than coercion, and judicial rulings continue to streamline FIR registration and investigation procedures in line with the timelines prescribed under the Bharatiya Nagarik Suraksha Sanhita (BNSS).

1.5. Police Reforms and Capacity Building

By 2047, the Prakash Singh judgment may finally be implemented in full. Technology, CCTV, AI, and automation will absorb routine functions like VIP security and crowd management, easing pressure from fund and manpower shortages. Narrow urban lanes may still complicate patrolling and emergency response, though integrated census, RTO, and Aadhaar data could enable individual-level verification.

Long-neglected police training needs to shift toward simulations, AI tutors, and app-based learning. Platforms like iGOT Karmayogi and www.cybertrain.in are becoming full self-learning ecosystems, with physical training narrowing to fitness, drill, and firearms. Continuous, adaptive training will be essential as criminals adopt new tools, and private players may help manage Integrated Command and Control Centers.

1.6. SMART Policing

Data analytics and digital platforms are driving "**SMART** policing," which stands for **S**ensitive, **M**odern, **A**lert, **R**eliable, **T**echno-savvy, marking a shift from reactive to proactive, ethical, technology-driven enforcement. Integrated Command and Control Centers (ICCCs), core to the smart city model, serve as centralized hubs for real-time CCTV monitoring, coordination between police, traffic, and emergency services, and improved situational awareness, potentially merging policing with administrative e-services on one platform. Police departments need to adopt blockchain-verified documentation where case records, Certificates, clearance reports, and receipts should be cryptographically signed and stored on a secure public ledger to ensure integrity and prevent delays or tampering.

1.7. Emergency Response and Service Delivery

As cities grow, emergency services must scale accordingly, with AI-enabled drones eventually reaching, transporting, and guiding distressed individuals directly. Police are expected to give Integrated Multi-Disciplinary Support to citizens, where police units should house support centers combining legal counsel, mental health professionals, and social workers under one roof for continuous victim care.

1.8. Ethical Policing and Accountability

Technology-driven policing leaves little room for abuse of power. Community policing is shifting toward genuine partnership, replacing "police raj" with trust and rights-aware citizens. Surveillance and proactive policing will deter crime more effectively, while investigations lean further on scientific evidence, digital forensics, and AI. Tools like geo-tagged evidence, e-case management, and e-courts can strengthen the justice system, and combating transnational crime will require stronger international cooperation.

1.9. Role of Technology in Enhancing Community Interface

Online complaints, 112 emergency services, and e-governance apps have made policing more accessible. AI, blockchain, and CCTNS are improving crime analysis and service delivery, even as police confront growing cyber fraud, dark net activity, and crypto-related offences, making digital investigation and financial intelligence central to urban policing. In an effort towards Scientific Interrogation Infrastructure, police divisions should feature non-coercive interrogation suites with continuous recording, forensic narration tools, and psychological profiling, shifting investigation toward objective science.

1.10 Strengthening Community Interface for the Future

Active citizen participation can strengthen policing outcomes; tourist police in some states are already building visitor confidence, and with urbanization bringing development and development attracting tourism, a proven growth driver elsewhere, India's expanding infrastructure could make it a major GDP contributor by 2047. Tourist security is central to that goal, but a single incident or restrictive local practice can disproportionately damage India's image, as seen in Goa, where taxi operators blocking Ola/Uber and overcharging tourists have pushed visitors toward Thailand. Eliminating political interference requires a robust, multi-tiered oversight framework.

State Police Boards/Authorities: Independent Police Complaint Authorities should be established at state and metro levels, led by retired judges, civil society experts, and human rights advocates.

Youth Engagement Programs: Police should invest in youth athletics, digital literacy, and civic leadership programs in vulnerable neighborhoods to build trust and counter organized crime recruitment.

1.11. Commissionerate System

Rising urbanization is increasing the need for the Commissionerate system, since measures like preventive detention currently require DC approval and police need to act fast. Maharashtra, with the most Commissionerates, illustrates this shift, reinforced by new criminal laws. Terrorism, NSA, and UAPA cases demand swift, coordinated action, which this system enables through rapid command execution and unified accountability.

2. Case Studies: Emerging Practices in Urban Policing in India

2.1. Delhi: Technology Integration and Public Safety

As the capital, Delhi hosts frequent national and international summits, and like London's citywide CCTV network, Indian cities' surveillance coverage has expanded significantly. A large floating population adds to Delhi's security load, while cybercriminals exploit routes through the Mewat region. Events like farmers' protests, the G20 and AI summits, and national-level parades and functions on Republic Days and Independence Days have tested the city's terrorism preparedness and traffic management. Capacity-building institutions, like Delhi Police's IFSO, Rashtriya Raksha University, NFSU branches, need wider replication, as does Bangalore's CSR-funded cyber lab.

2.2. Mumbai: Traffic Management and Urban Coordination

Mumbai's density, mobility challenges, and infrastructural pressures are compounded by its financial hubs, coastal exposure, film industry, and underworld links to Pakistan-based terror outfits. Even so, its policing model shows strong coordination among police, municipal bodies, and transport agencies.

2.3. Hyderabad: Integrated Command and Control Centre

Hyderabad's ICCC unifies surveillance, traffic, and emergency response on one platform. Its SHE team for women's safety and its DGP-reviewed performance scoring software at the Thana Level are models for other states. Kerala's AI-enabled traffic system, since adopted by Karnataka on the Bangalore-Mysore highway, shows the value of sharing best practices.

STRENGTHENING INTER-AGENCY COORDINATION FOR PUBLIC SAFETY AND NATIONAL SECURITY

In today's rapidly evolving security environment, the coordination of urban police must be broadened to include Armed Forces viz Military Police, Naval Police, and Air Force Police, Central Armed Police Forces (CAPFs), intelligence agencies, and other public safety organizations operating within the same urban regions.

These organizations possess valuable resources, specialized expertise, surveillance capabilities, and intelligence assets that can significantly enhance public safety when appropriately utilized. Given budgetary constraints, it is neither practical nor economical for every agency to procure identical equipment. For example, if the local police possess two surveillance drones while a nearby Air Force establishment has additional drone capabilities, mechanisms should exist to facilitate resource sharing during VIP security, disaster response, major public gatherings, counter-terrorism operations, and other large-scale events.

Similarly, to secure interoperability, where legally and operationally appropriate, integration should focus on situational awareness, emergency coordination, communication protocols, and resource optimization while respecting legal mandates, operational security, and jurisdictional boundaries.

Although coordination meetings are held regularly, they should involve empowered decision-makers and focus on practical cooperation rather than becoming routine formalities. Organizational silos and ego-driven rivalries must give way to collaboration in the larger public interest. Modern security challenges require fusion, interoperability, and synergy. The era of agencies working in isolation is over; effective public safety depends on seamless inter-agency cooperation and optimal utilization of available resources.

POLICY RECOMMENDATIONS AND ROADMAP

- **Strengthening Institutional Capacity**

  Platforms like www.cytrain.in and iGOT, alongside physical training, help police keep

pace with new challenges. The Samanvaya Platform is a Management Information System (MIS) and data repository developed under the Indian Cyber Crime Coordination Centre (I4C)**.** It enables Law Enforcement Agencies (LEAs) across India to collaborate effectively in investigating cybercrimes. Nyaya Sanhitas bring dedicated Scene of Crime officers, and investigators need simulation exercises, forensics, and training on newly emerging areas and challenges. Best case investigations from the CBI and NIA may be shared at the Thana level. Standard Operating Procedures (SOPs) are created and circulated as new investigative domains emerge. Training should also cover soft skills like communication and ethics. Interrogation rooms and detention cells should have tamper-proof, cloud-stored CCTV audited weekly by independent observers, and officers should complete mandatory annual training to qualify for promotion. Immersive VR Simulation can be part of Tactical training centers, exposing officers to high-stress scenarios, sharpening de-escalation and use-of-force judgment.

Police headquarters should maintain confidential psychological wellness units offering routine, stigma-free mental health support for police personnel.

- **Prison Reforms**

  Most Indian prisons fall short of Western standards. Radicalization, recidivism, drug use, jailbreaks, and attacks on staff are rising, alongside prolonged undertrial delays. Justice delivery must accelerate under the BNSS framework, and the well-documented VIP treatment of influential inmates needs to be ended.

- **Institutionalizing Accountability and Transparency**

  Delayed FIR registration, custodial deaths, illegal arrests, and coercive interrogation remain common complaints even as courts push back on human rights violations. Police must justify arrests and seizures through scientific investigation, since most acquittals stem from procedural lapses. The recurring blame game between police and judiciary, over evidence handling versus investigative appreciation, needs to end in favor of better coordination among police, judiciary, forensics, and prisons. Laws now demand scientific, technology-driven investigation, yet NCRB's 3% conviction rate still lets many criminals escape accountability. Transparent postings, minimum tenures for district heads and the DGP, and an end to police-criminal nexus and internal corruption are equally overdue.

- **Roadmap for Urban Policing Toward Viksit Bharat**

  - 2026–2030: Convert urban areas over 50,000 residents to Metropolitan Commissionerates. Complete tamper-proof, cloud-audited CCTV across police facilities. Launch a unified digital public service app in tier-1 cities.
  - 2030–2038: Deploy predictive policing software and AI video analytics in major metros. Reach 33% female representation across ranks. Implement automated traffic enforcement and adaptive green corridors.
  - 2038–2047: Integrate quantum-encrypted communications and autonomous drone safety networks. Transition all police transport to zero-emission EVs. Establish a zero-trust cybersecurity command network.

Key Metrics for Evaluating Urban Policing Success: To measure the effectiveness of this transformation, urban police units should be monitored using a comprehensive Public Safety Performance Index, focusing on outcomes rather than simple crime statistics:

Key Performance Indicator (KPI) [19, 20]	Current Baseline (Estimated)	Target (2030)	Developed Target (2047)
Emergency Response Time	15–30 Minutes	< 7 Minutes	< 3 Minutes
Public Trust & Confidence Index	Variable / Moderate	> 75% Approval	> 95% Approval
Digital Public Service Delivery	Partial / Fragmented	80% Paperless	100% Frictionless
Female Representation (All Ranks)	~10–12%	25%	33%+ Equal Split
Cyber-Financial Crime Resolution	< 25% Clearance	> 60% Clearance	> 90% Clearance
Custodial Misconduct Incidents	Tracked Nationally	Zero Tolerance	Absolute Elimination

CONCLUSION

As technology advances, people are becoming more tech-savvy, and so are the criminals. Internet, mobile usage, and social media have penetrated every nook and corner and opened opportunities to commit crime. The rapid urbanization is bringing more novel types of frauds in urban areas. Viksit Bharat not only aspires to a safe city but a Just city. With 46% of the population expected to be in urban areas by 2047, the complexity of urban policing may increase with the use of AI and technology for disruptive purposes. Police are expected to work with improved coordination and response, while maintaining ethical safeguards and respecting individual rights. Police need to gain confidence from the public such that they themselves help in crime prevention and Investigation.

Viksit Bharat 2047 offers a clear framework, balancing innovation with responsibility, efficiency with accountability, and authority with public trust. The path forward demands a policing system ready for both today's challenges and tomorrow's demands. A policing system that is ethically grounded, technologically sound, and citizen-oriented will play a crucial role in shaping safe, secure, and well-governed urban environments, thereby contributing to the broader national aspiration of building a developed and harmonious society by 2047.

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The Criminal Procedure (Identification) Act, 2022: A Watershed Moment for Innovations and Technological Interventions





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ABSTRACT

A transformative shift in India's criminal justice system has been introduced through the Criminal Procedure (Identification) Act (CrPI), 2022. The new Act has replaced the century-old Identification of Prisoners Act, 1920, to incorporate contemporary investigative technologies and innovative practices. The study tries to review and analyse the new Act's legal, forensic, and technological dimensions. It explores the integration of modern biometric evidence collection techniques, DNA profiling, and digitalisation of the criminal identification framework in India. The study also examines the regulatory Criminal justice frameworks of various countries so as to understand the technological innovation and good practices adopted and the eventual outcomes in mitigating delays in the investigation of crimes.

The study is based on an integrative approach of literature review following the PRISMA guidelines, enhancing the evidence reliability and investigative efficiency. The findings of the study indicate the transition towards scientific, data-driven policing and real-time inter-jurisdictional coordination. The Act represents a foundational shift towards transparent, technology-enabled forensic innovations and modern criminal identification procedures for faster disposal of cases and process efficiency.

Keywords: *The Criminal Procedure (Identification) Act, 2022, Automation and AI-Interventions, Forensic Innovation, Criminal Justice System, Data Governance, IRIS, Gait Analysis*

1. INTRODUCTION

"The Identification," a poignant poem by Roger McGough, describes the profound emotional turmoil of a father as he examines the evidence and confronts the grim reality of identifying his 14-year-old son's body, a victim of the Belfast bombings on Friday, 21st July 1972 (BBC, 2022; BBC Archives, 2023). The poem explores the complex process of identification, which echoes across various fields.

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The theme of identity has intrigued poets, writers, and philosophers from a psychological or existential perspective. However, law enforcement executives, lawyers, and judges examine identification through the lenses of ethics, justice, and legal procedures.

An accurate and reliable method of human identification is fundamental to effective law enforcement and the administration of justice, as it can establish a person's identity and connection to a crime. It furthers the purpose of the law by punishing the guilty and protecting the innocent (Hoover, 1972).

Historically, different methods of identification were used for various purposes across the world (Hoover, 1931, 1933). Since ancient times, several cultures, including Indian culture, have used finger impressions as a means of identification (Barnes, 2012; Sodhi & Kaur, 2003). Numerous ancient Hindu Scriptures describe the Indian system of human marks used for identification, especially fingerprints (Sodhi & Kaur, 2003; Zysk, 2015).

In the modern era, the distinctive patterns of fingerprints emerged as one of the earliest scientific methods of identification. In the efforts to scientifically study fingerprints, noteworthy mentions are Johannes E. Purkinje, William Herschel, Henry Faulds, Francis Galton, Ivan (Juan) Vucetich, Azizul Haque, Hemchandra Bose, and Edward Richard Henry (Barnes, 2012; NCRB India, 2020; Polson, 1951; Sodhi & Kaur, 2005).

In 1897, the World's first fingerprint Bureau was established in Calcutta, largely due to the efforts of two Indian police officers – Sub-Inspectors Azizul Haque and Hem Chandra Bose, in collaboration with Mr. Edward Richard Henry, Inspector General of police, Lower Provinces, Bengal, India (Bami, 1982; Sodhi & Kaur, 2005). On 12th June 1897, the Council of the Governor General of India approved the report of the Strahan and Pedler Committee, which had been formed to evaluate the system of identification through finger impressions. The committee concluded that "*the method of identification of habitual criminals by means of fingerprints, as worked on the system of recording impressions and of classification devised by Mr. Henry, may be safely adopted as being superior to the anthropometric method" (Henry, 1900).*

The first conviction in modern history using fingerprints occurred in 1892 when Francisca Rojas was found guilty of murdering her two children in Buenos Aires province, Argentina. In another murder case in Bengal, India, in May 1898, a thief named Kangali Charan, identified by his thumb impression, was convicted of murdering his former employer (Barnes, 2012; Central Finger Print Bureau NCRB India, 2017; Henry, 1900; Polson, 1951).

The objective of this article is to examine the Criminal Procedure (Identification) Act, 2022, as a transformative legal framework enabling the use of advanced biometric technologies for criminal identification. It seeks to highlight the role of national systems and institutional mechanisms in creating a centralised, interoperable database to support the criminal justice system. The article also seeks to highlight the importance of effective implementation in strengthening investigation processes and improving the overall functioning of the criminal justice system. It further identifies similar Acts developed in other economies as well as the innovative criminal identification mechanisms adapted therein.

2. REVIEW OF LITERATURE

An intensive need was felt to bring in effectiveness, modern technological interventions, and efficiency into the criminal identification procedures (Parween & Jain, 2023). The 87th Law Commission Report served as a crucial document in shaping the trajectory of the modern Indian criminal identification law. It gave a fresh outlook to the older Identification of Prisoners Act, 1920 by providing recommendations to incorporate a varied innovative technique to identify the traces of crime (Law Commission of India, 1980). The new Act came into force on 18th April 2022. The Criminal Procedure (Identification) Act authorises the collection and preservation of the measurements of convicts and other persons for the purpose of identification and criminal investigation (Bajpai & Baweja, 2022). Despite the enactment of the new Act to enhance and upgrade the provisions of the previous Identification of Prisoners Act, many fundamental flaws were identified by authors (Yadav, 2022). The new Act opens up the ambit of identification data collection, including fingerprints, retina scans, biological samples, and behavioural attributes such as gait, signatures, and handwriting (Divyashree, 2022). In addition, it ensured the ease of person identification with the help of a repository of measurements maintained by the National Crime Records Bureau (NCRB) (R. Karuppasamy, 2023). However, Tiwari (2023) believes that the Act does not coincide with Article 14, Article 20(3), and Article 21 of the Constitution. (Raghunath, 2024) advocates the formulation of critical data governance, collection, and storage technologies that are rooted in social justice and ensure the equitable needs of the communities. At the same time, Pokhariyal & Dubey (2024) emphasise the importance of fairness and accuracy in criminal investigation procedures and forensic science.

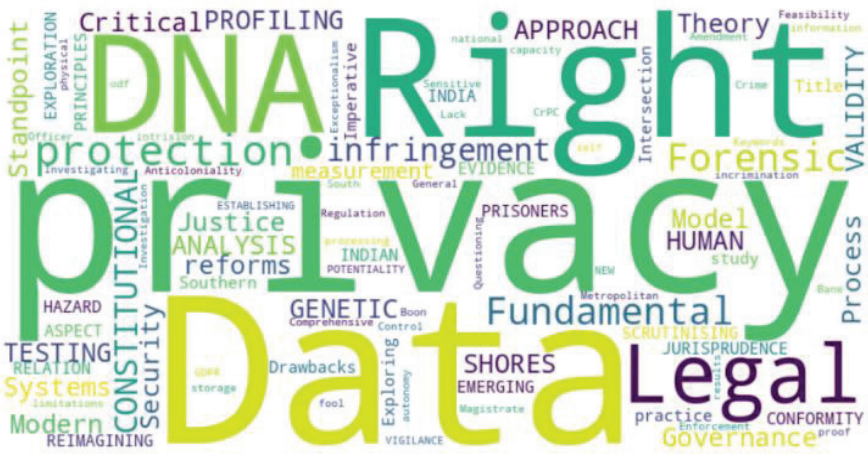


Figure 1: Word Cloud of the frequently appearing words in the reviewed literature

3. RESEARCH GAP

Most of the existing studies of the Criminal Procedure (Identification) Act, 2022, mainly focus on the legal, privacy, human rights, and fundamental rights aspects, but they fail to consider the law enforcement enabling aspects that might go a long way in upscaling criminal identification

and saving innocent lives. This can further be identified through the word cloud (Figure 1), which highlights the word frequency in the reviewed literature. The focus continues to place significant emphasis on constitutional issues while failing to provide much space for how systematic law enforcement mechanisms, under the Act, may be maximised to streamline investigative efficacy. In addition to these, no significant literature was found that could provide an elaborate analysis of foreign acts and innovative practices that have managed to harness their biometric and forensic identification systems with success, an opportunity for replication of the same for better implementation and adoption of the Act in India. Moreover, there is a clear lack of assessment of the technological advancements and assistive technologies that may be harnessed for the benefit of the nation and society as a whole after the advent of the Act. This research seeks to fill these neglected dimensions, providing a multi-stranded view, integrating law, technological interventions, comparative analysis of similar acts in various economies, and the best practices adopted therein.

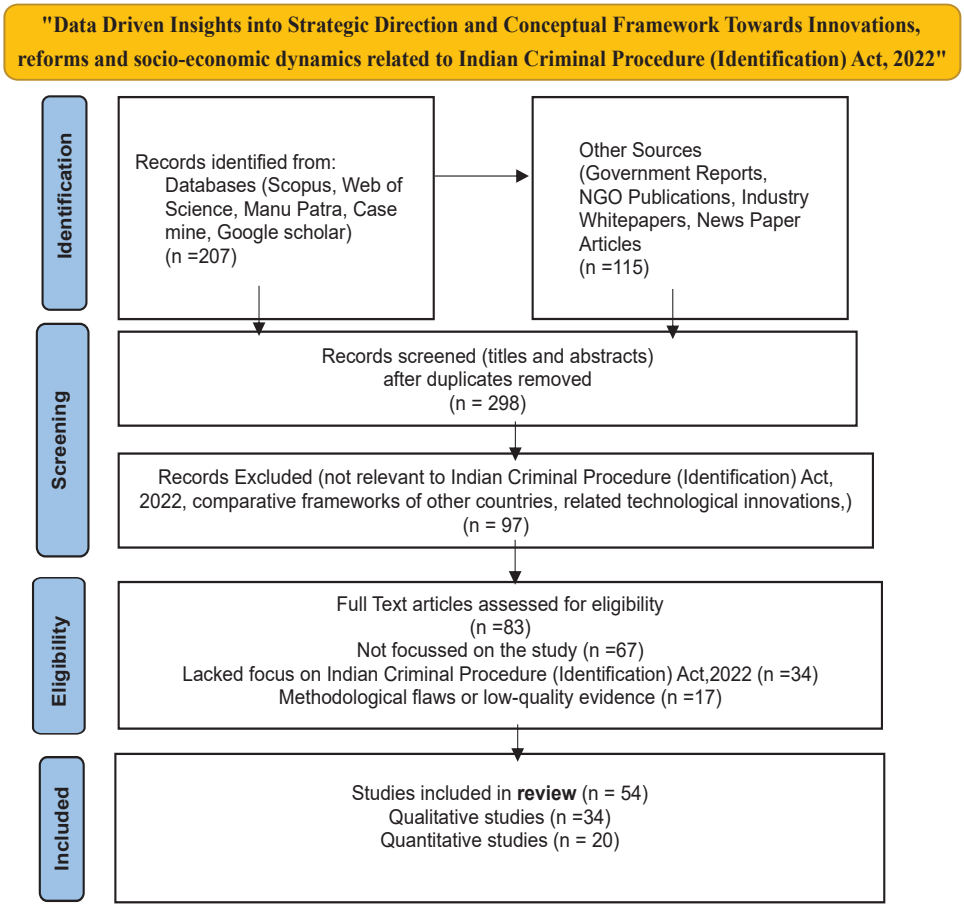


Figure 2: Prisma Flow Diagram of the methodology adoption of the study

Source: Authors

4. METHODOLOGY

The research covers multiple aspects of the research problem; it became imperative to formulate a tailor-made research design to ensure appropriate inclusivity of data from various sources (Snyder, 2019; Torraco, 2005).

Appropriate literature using various databases has been reviewed to understand the role and importance of the Criminal Procedure (Identification) Act, 2022, and to analyse its potential implications on legal reforms and technological innovations in India. The study also tries to answer the research question of what similar Acts are formulated in other economies and what good practices have been adopted.

The study was conducted in four stages, wherein stage I, Identification and selection of relevant documents were done through various databases and sources like Google Scholar, Scopus, Science Direct, White papers, government and other organisations' published reports, newspaper articles, websites, cases, etc. The keywords used for the review search are "Criminal Identification Act", "Evidence Act", "Fingerprint Identification", "Criminal Evidence", "Innovative technologies in criminal justice", "Act of Criminal Evidence", "The Criminal Procedure (Identification) Act, 2022", "Historical framework of criminal identification", "legal reforms in criminal identification process". The above-mentioned keywords helped to download 322 research papers, articles, reports, and documents. In Stage II, the identified articles that were in open access and had full text available became eligible to be screened and selected on the basis of their relevance to the objectives of the study. 83 articles became eligible to be selected for the study.

The selected data were analysed to identify the patterns and gaps in the published literature, and 54 articles were included for the review process. The findings' synthesis gave a comprehensive overview of the different aspects of the topic. An integrative approach of literature review has been applied for writing the review so as to synthesise diverse evidence and build a comprehensive understanding of the complex interventions.

5. DETAILED ANALYSIS OF KEY PROVISIONS AND IMPLICATIONS OF THE ACT

The Criminal Procedure (Identification) Act updates an over-century-old framework by authorizing advanced biometric and biological measurements for today's challenges of cybercrime, organized crime, and sophisticated offenses. It creates a statutory basis for digital, scientific policing and long-term record management.

Section 2(b) of the Act expands "measurements" to include fingerprints, palm-prints, iris/retina scans, physical and biological samples, and behavioural attributes (handwriting/signature), extending the coverage beyond convicted persons to include arrestees, detainees, and suspects. The inclusion of behavioural biometric attributes like voice recognition, handwriting, and Gait extends the purview of the criminal justice system, which may prove to be valuable in criminal identification and the crime detection process. It also mandates digital storage and Standard Operating Procedure (SOP) driven handling by NCRB and state agencies. The NCRB functions as a nodal agency for the Crime and Criminal Tracking Network System (CCTNS) and National

Automated Fingerprint Identification System (NAFIS); the former helps in linking all the police stations for sharing information and record-keeping, digitally, and the latter keeps a fingerprint database at the national level for criminal identification.

Technological interventions have accelerated the identification of miscreants, shortened the investigation time span, and strengthened evidentiary value by providing scientifically verifiable data. There has been an argument that when biometric data is being freely collected by private agencies in the name of providing automated ERP solutions to ease HR processes or facilitate visa formalities, then why should the collection of biometric data for national and citizen security be questioned in the name of privacy and security? The biometric and biological data collected by government agencies are encrypted, secure, and coded, taking care of privacy, security, and ethical issues.

The law allows for encrypted databases across the nation, real-time biometric matching, and pipeline integration for AI analytics and predictive tools. The digital integration of biometric data with the help of NCRB has helped real-time interstate data sharing, providing a transformative shift towards scientific and technology-driven law enforcement in India, which is the need of the hour.

5.1 The Role of NCRB as the Implementation Agency for CrPI

The National Crime Records Bureau (NCRB) has been designated as the nodal agency for implementing the Criminal Procedure (Identification) Act, 2022, across all States and Union Territories. Under this mandate, the CrPI system has been developed to capture, store, and process biometric measurements of arrested and convicted persons for creating a national searchable repository of face, iris, and DNA profiles. This system also generates a unique biometric-based ID for each individual, enabling reliable identification even in cases where a person changes name or other identification particulars. The national repository supports the Police and Central Law Enforcement Agencies (LEAs) across States/UTs in performing search and matching operations for effective identification of criminals. The implementation of the CrPI Act is being undertaken by States/UTs and Central LEAs with technical and institutional support from NCRB. Key activities include the establishment and operationalization of Measurement Collection Units (MCUs), deployment of biometric capture devices, and integration with national platforms such as CCTNS and NAFIS. States/UTs are following the Standard Operating Procedures (SOPs) and technical guidelines issued by NCRB for uniform data collection during enrolment. States/UTs also ensure regular synchronization of CCTNS data from the State Data Centre (SDC) to the National Data Centre (NDC) to enable seamless retrieval of FIR-linked details during enrolment from CCTNS to CrPI application. Capacity building of police and prison personnel is also being carried out to ensure effective enrolment of accused and convicted persons, along with uploading of biometric (face and iris) measurements after approval from the Supervisory Officer(*Criminal Procedure (Identification) Rules, 2022*, n.d.).

Under the CrPI Project, 2,649 Measurement Collection Units (MCUs) are being established across Police Districts/Commissionerates, Prisons, and zonal units of CBI, NIA, and NCB. As of 22.04.2026, a total of 1,291 MCUs have been established across 36 States/UTs and Central Law Enforcement Agencies. Further, 4,15,297 enrolments – comprising face, iris, and DNA measurements (where applicable) – have been recorded so far. The face and iris matching engines are live in production, providing matching functionality for face, iris, and DNA profiles (*Ministry of Home Affairs | Government of India*, n.d.).

5.2 Key Aspects of the State-Level Implementation of the Criminal Procedure (Identification) Act, 2022

The CrPI Act came into force on 18th April 2022 with several operational layers for state-level implementation. Under Section 4(3) of the Act, each state government and Union Territory was mandated to notify a suitable agency to collect, preserve, and share measurement data in the respective jurisdiction. The data collected at the state level is centrally processed, managed, shared, and disseminated by NCRB.

The states have been instructed to either frame independent rules and SOPs or adopt the central CrPI rules, 2022 (notified by the Ministry of Home Affairs), to align with the local police procedures. The state police are being equipped with iris scanners, facial recognition systems, and biological sample collection tools by the Union Home Ministry for capacity building and infrastructure rollout.

The structured training programs have been designed and conducted at the state and central levels for capacity building of the police personnel, focusing on biometric data handling and effective forensic investigation.

5.3 Technological Advancements and Future Intervention under NCRB guidance

As biometric technology evolves, the CrPI system has the potential to incorporate additional modalities beyond face, iris, and DNA. These may include gait analysis, voice biometrics, and high-resolution palmprint capture. Integrating such modalities will strengthen multi-factor identification and improve reliability in cases where traditional biometrics are unavailable or degraded.

Future phases of the CrPI system may explore the use of mobile handheld devices to support field-level biometric capture. Portable units equipped with face, iris, and fingerprint sensors can enable real-time identification during patrol duties, checkpoint operations, raid teams, and emergency deployments. This will reduce dependency on fixed locations and significantly enhance the ability of law enforcement to verify identities on the move.

Once fully implemented, the CrPI system will significantly strengthen the Criminal Justice System by enabling scientific investigation, accurate identification, and improved conviction rates through reliable forensic evidence. The implementation framework remains dynamic and continues to evolve in line with technological advancements and operational requirements.

6. INNOVATIVE TECHNOLOGIES/ FRAMEWORKS OF CRIMINAL IDENTIFICATION IN VARIOUS ECONOMIES

The significant technological innovations and real-time interventions in India, the UK, the USA, Australia, the European Union, and Singapore have demonstrated tangible outcomes in effective criminal identification and safeguarding of innocent citizens from multiple crimes and misidentification of suspects. However, proper utilisation of technology and its effective implementation are dependent on a well-designed framework, training programs, and awareness campaigns for all stakeholders (Bakhtiar et al., 2025a). The following Table 1 showcases the legal frameworks and criminal identification initiatives taken up by various economies integrating technology, AI, and ethics.

Table 1: Table showing the innovative technologies/ frameworks of criminal identification in various economies and the enabling outcomes

Country	Legal Provision/ Framework	Innovative/ Technological interventions	Enabling outcomes
India	The Criminal Procedure (Identification) Act 2022, The Criminal Procedure Identification Rules 2022,	Expanded measurements, incorporating Iris/Retina scan, physical and biological samples, behavioural attributes like gait, signatures, and handwritings, etc., are required for forensic analysis. 75 years of digital retention of identification sample data in NCRB repository (The Criminal Procedure Identification Rules 2022, 2022; India, 2022; Ministry of Law and Justice, 2022).	Introduction of digital devices like body-worn cameras, biometric systems, introduction of audio-visual aids in recording the scenes of crime, examination of the witnesses, recordings of bail and remand procedures, providing more digital data to validate the identification of criminals and authentication of the process (Bureau of Police Research and Development (BPRD), 2023). NCRB has established a systematic and scientific criminal identification framework with the help of the Crime and Criminal Tracking Network & System (CCTNS) and the National Automated Fingerprint Identification System (NAFIS).
United Kingdom	Police and Criminal Evidence Act 1984 (PACE), Protection of Freedom Act 2012, UK	Adoption of AI in Digital Evidence Management System to detect sensitive and confidential information through body-worn camera images and video recordings. Use of mobile fingerprint	Policing in the UK became more evolved, well-equipped, and accountable using standardized procedures and regulations related to biometric data like DNA samples and fingerprints. There has been an extension in digital policing using AI

Country	Legal Provision/ Framework	Innovative/ Technological interventions	Enabling outcomes
	Borders Act 2007, Data Protection Act 2018, and UK General Data Protection Regulation (GDPR)	scanners, Iris and Retina technology, which was earlier limited to serious crimes(Kate Whannel, 2025; VIDIZMO Team, 2025; Zander, 2010).	and innovative technologies in face recognition and crime detection processes. These Acts together have enhanced public trust, transparency, and fairness in police powers (lawyersnjurists.com, 2025).
United States of America	Rapid DNA Act 2017	Adoption of Rapid DNA testing technologies and integrating them at the local, state, and National level through the National DNA Index System (NDIS) and FBI Combined DNA Index System (CODIS). The Act has enabled the FBI to integrate the latest Next Generation Identification (NGI) biometric technologies like fingerprint, iris scans, and facial recognition under the FBI Forensic DNA program (Budowle et al., 1998; Laboratory Division Biometrics Analysis Section, 2024; Rapid DNA Act of 2017, 2019; United States Government, 2025).	Accelerated justice and operational efficiency by providing automated DNA analysis within 90 minutes. FBI is now equipped with a comprehensive forensic intelligence network having over 20 million profiles, enabling inter-jurisdictional matches and solving pending cases. A holistic biometric system has evolved, providing broader identity intelligence across agencies. The US model has become the global template for integrating automation, legal oversight, and privacy standardisation in forensic science (FBI, 2025).
Australia	Crimes Act 1914 (Part 1D); ACIC national services (NAFIS/NCIDD)	DNA profiling and matching system and biometric fingerprint/ palm printing identification system through live-scan, latent print capture, image matching and automated search process. Automated and centralised national database search systems have been created, known as the National Automated Fingerprint Identification System (NAFIS) and the National Criminal Investigation DNA Database (NCIDD). NAFIS provides near real-time uploads of identification data and	NAFIS holds 12.5 million fingerprint sets, and NCIDD holds more than 1.7 million DNA profiles of the criminals, suspects, and volunteers. These systems have enhanced the Australian Police's ability to link crime scenes to suspects across jurisdictions, and the identification process has become more effective and faster. The legislation supports the admissibility and reliability of DNA evidence and helps guard against the misuse of profiles, protecting privacy and integrity (Smith, 2018).

Country	Legal Provision/ Framework	Innovative/ Technological interventions	Enabling outcomes
		warrants quick alert and intelligence. More advanced matching technology supporting familiar searching and kinship matching has been established under NCIDD to help investigate missing persons cases and link crime scenes (Australian Criminal Intelligence System, 2025; Blau & Rowbotham, 2022; Oosthuizen et al., 2025b).	
European Union	Prüm II Regulation-2024	Modernised, automated, cross-border biometric matching of DNA profiles and dactyloscopic data. Automated exchange of facial images for facial comparison and recognition across borders, and automated matching of license plates of vehicles across databases. Interoperability and system integration for standardised results, aligning European Union interoperability architecture to facilitate the Area of Freedom, Security and Justice (AFSJ) domain with enhanced internal security, effective migration management, and law enforcement. (European Commission, 2024; Home Office, 2024; Sahgal, 2024).	Automated searching and standardised machine interfaces help to shorten the cross-border identification process time. The investigative reach has been increased due to facial images and criminal record metadata. The EU member states have been able to correlate due to interoperability. The biometric surveillance capacity has increased (EUROPA, 2024).
Singapore	Registration of Criminals Act-Chapter 268	Creation of a DNA database and a non-DNA samples register to keep a record of suspects, convicts, and criminals. Use of Singapore Forensic Biology Laboratories for advanced Mitochondrial DNA sequencing technologies (Ministry of Home Affairs, 2022; Singapore Statutes Online, 2015).	A new and advanced collection of DNA databases has helped the Singapore police to solve major crimes. The new biometric modalities have enhanced the ability to match the crime scene evidence with the individuals (Aqil Haziq Mahmud, 2022).

7. CONCLUSION

The Criminal Procedure (Identification) Act, 2022, redefines the criminal identification framework in India through innovative, technologically driven biometric and data-led reforms. It has strengthened the investigation procedure, bringing in speed, accuracy, transparency, and inter-agency interoperability. Hence, the new Act has been able to align India's criminal justice system with the global standards prevalent in this contemporary era (Oosthuizen et al., 2025a). The inclusion of behavioural attributes along with biological and physical measurements has expanded the scope of the criminal identification system across economies. The Indian Criminal (Identification) Act has explicitly included behavioural attributes in the Act.

The comparative analysis framework among legal frameworks of various countries, like the PACE Act (UK), Rapid DNA Act (USA), etc., portrays identical patterns of technology adaptation with constitutional safeguards (Raghunath, 2024). Hence, the Act symbolises a watershed moment by positioning India as a global leader in forensics and technological jurisprudence.

The Criminal Procedure (Identification) Act, 2022, is a breakthrough in the modern era where integration of technological and AI interventions with the criminal justice system is the need of the hour. In India, NCRB has structured a roadmap for 'assistive policing' by streamlining technology, law, and ethics (NCRB India, 2025). NCRB governs the crime data and automated system for storing, matching, and retrieving fingerprint data with the help of CCTNS and NAFIS, respectively, providing a sustainable system for faster crime detection and criminal identification. The system ensures accountability checks and implements encrypted safeguards for data privacy and security (Bureau & Affairs, 2020).

8. SUGGESTIONS AND FUTURE SCOPE OF RESEARCH

The implementation of the CrPI system is based on a robust implementation framework requiring dynamic capacity building, skill development, and infrastructure advancement initiatives. The comparative analysis and incorporation of good practices adopted in various countries regarding the criminal identification system and framework may further enhance the system's effectiveness and technological innovations in India (Singh Dari et al., 2025). The capacity building and public outreach campaigns for enhancing awareness of the Acts' benefits and addressing the misconceptions regarding the privacy and security issues can translate into a more transparent, fair, and trustworthy environment for law enforcement (Bakhtiar et al., 2025b). There is a need to design a robust data migration system that may withstand technological disruptions and transition over the period of time. Innovative and assistive technologies for the criminal justice system provide a platform for researchers, start-ups, and entrepreneurs to design technologies and AI-assisted automated systems that may further enhance criminal identification and data interoperability functions. There is further scope for empirical research on the socio-economic implications of the Act, which may be studied in the light of developing new business perspectives, research initiatives, a safer environment, and community participation.

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Spaces for Truth – Redefining Interview Rooms





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ABSTRACT

Indian policing is taking huge strides towards becoming a scientifically driven, technologically sound, and legally informed process. While the aim of such policing is to ensure punishment for the guilty, equal emphasis is given to ensuring that innocent individuals are protected from wrongful accusations, undue harassment, and miscarriages of justice. Therefore, strong initiatives such as strengthening forensic capacities, implementation of Naveen Nyaya Sanhitas, and modernization of police forces are being carried out across India. This paper intends to throw light on another infrastructural aspect that holds the capacity to determine the overall quality of interrogations and investigations: interview rooms. We observe that the world is moving towards adopting scientific interrogation/interview techniques that are more result-oriented while also being ethical. For effective use of such techniques in India, proper interviewing spaces are required. We examine the focus of recent landmark judicial decisions on the setting up of CCTV systems, their connection to human rights and maintaining dignity during interrogations, and the benefit of standardized infrastructure in such scenarios. An attempt is also made to establish certain guidelines which may be referred to for standardization and uniformity of interrogation and interviewing rooms in Indian police stations.

Keywords: *Interview Rooms, Scientific Techniques, Judicial Oversight, Human Rights & Dignity*

In criminal investigations, interviews with victims and witnesses form the basis of rapport building, knowledge assimilation, fact and evidence-based questioning, and ultimately, identification of suspects. An integral part of this process is the setup in which interviews are conducted. The locations, i.e., interview/interrogation rooms, method of talking to the individual, and strategies used to elicit information – all play a decisive role in the effectiveness of the interview. This is especially crucial when dealing with vulnerable populations. This paper is an attempt to analyze

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the current practices of interview conduction during investigations and the setup of interview rooms in India. We also attempt to review landmark decisions by judicial authorities regarding conducting investigative interviews and their implementation across the nation. This paper is being composed in an effort to enhance the fact-finding capacities of law enforcement agencies by utilizing scientific techniques and set-ups to ensure the highest quality of investigations with due regard to dignity, safety, and effective participation of victims and other vulnerable persons in the process.

CURRENT GLOBAL SCENARIO OF INTERVIEW ROOMS

To begin with, previously, literature has described interview rooms as being any room/place, formal or informal, in which interviews of victims, witnesses, or even suspects are conducted. These can range from a sitting area within a police station to even the home of the interviewee (Hoogesteyn, Meijer, and Vrij, 2020a), while interrogation rooms or spaces are understood to be designated spaces where suspects are questioned, mostly in a formal manner to elicit a confession. However, for the purpose of this paper, we shall use the term "interview room" to encompass all purposes for which interaction between police officials and other members of the public is bound to happen in the due course of investigation.

Globally, different interviewing practices are used, with focuses ranging from confrontation (often termed as adversarial) to cooperation, or information-gathering. Techniques need to be modified based on the population being interviewed and the requirements of each interview. As such, a few techniques emerged as the most popular among professionals worldwide. The **Preparation and Planning, Engage and Explain, Account, Closure, and Evaluation** or **PEACE** technique promotes rapport-based, non-coercive interviewing and aims to elicit reliable information without threats, deception, or pressure (Clarke & Milne, 2001). Rapport-based techniques are also highly effective, and interviewees are more likely to be cooperative when the interviewer adopts a humane and empathetic approach (Holmberg & Christianson, 2002), and this empathetic approach is especially beneficial while interviewing victims (Jakobsen, 2019). Victims of crime often require safety, validation, and a feeling of control over their investigation, while also being protected from re-traumatization (Birch, 2024). To ensure that an investigation is victim-centric, empathy and clarity must be prioritized while interacting with victims, thus enhancing cooperation, accuracy, and completeness of disclosed information.

Another technique is the **Reid Technique**, which was designed to elicit confessions, often using psychological manipulation, confrontation, and minimization. While effective in some cases, it has been criticized for promoting false confessions, especially among vulnerable suspects (Kassin et al., 2010; Inbau et al., 2013; Meissner et al., 2023; Leo, 2017).

The following table presents primary interviewing frameworks utilized by different countries around the world:

Table 01: Primary interviewing frameworks in different countries

Country / Region	Technique primarily used	Approach / Type
United States of America	REID Technique (Meissner et al., 2012)	Accusatorial /Adversarial
Canada	Reid Technique and Phased Interview Model (PIM) (Snook et al., 2020).	The Reid Technique is accusatorial, while PIM blends information-gathering with accusations.
United Kingdom	PEACE Model (Brimbal et al., 2021; Meissner et al., 2012)	Information gathering
Australia		
New Zealand		
Norway		

The global trend is increasingly shifting away from confession-centric methods like Reid and toward information-gathering approaches such as PEACE (Catlin et al., 2024), with research supporting the use of rapport and empathy during interviewing (Baker-Eck, Bull & Walsh, 2020). This movement was further reinforced in 2024 when the United Nations introduced the "Mendez Principles," a manual outlining an international standard for non-coercive, rights-based interviewing, and also best practices for creating ideal interrogation spaces (United Nations, 2024). Interestingly, it was also found that interviewers prefer to engage in non-coercive interviews as they produce reliable results (Sivasubramaniam et al., 2025). Researchers have also captured how the changing trend of interviewing techniques is also related to the setup in which said interviews are conducted (Kelly & Redlich, 2026). This highlights the role of interview rooms not only as spaces for questioning but as facilitators of ethical investigation.

Across the world, the design and structure of interview rooms have evolved in alignment with modern, ethical, and legally sound investigative practices. The physical space in which investigative interviews are conducted plays a foundational role in shaping the behaviour and cooperation of victims, suspects, and witnesses. Supporting this, the study by Hoogesteyn, Meijer, and Vrij (2020b) illustrates how the physical features of an interrogation room have the capacity to elicit disclosures ethically and willingly. Similarly, Miller, Redlich, and Kelly (2018) explain that rapport-building environments help investigators to foster rapport and facilitate open communication with the interviewees.

International standards acknowledge that the interviewing environment can either facilitate honest disclosures or contribute to false confessions. Research indicates that harsh, poorly designed interview spaces can heighten stress, increase anxiety, and lead to unreliable or false confessions (Meissner et al., 2023). On the other hand, the Federal Bureau of Investigation (FBI, 2016) emphasizes that professionally designed rooms contribute to increased cooperation and better information-gathering, while minimizing intimidation or duress. Environments that are soundproof, well-lit, comfortable, and neutral contribute to increased disclosure and reduced resistance during interviews (FBI, 2016). Therefore, interview rooms are integral to investigative infrastructure and reflect a commitment to both the integrity of evidence and the rights of the

accused. At present, the United Kingdom (Vaughan et al., 2024), Ireland (Daly, 2024), and Japan (Kyodo, 2019) have already adopted the improved interview rooms.

While appropriate infrastructure is essential, effective outcomes also depend on employing the right techniques when eliciting information from witnesses or suspects.

INTERVIEW TECHNIQUES AND LEGAL FRAMEWORK IN INDIA

Article 21 of the Indian Constitution states that "No person shall be deprived of his life or personal liberty except according to procedure established by law," while Article 20(3) provides that "No person accused of any offence shall be compelled to be a witness against himself." Together, these rights ensure that individuals are treated with dignity and fairness, especially during investigations. They aim to protect citizens from arbitrary actions while also enabling law enforcement to carry out their duties within a just and lawful framework. However, Human Rights Watch (2009) had documented systemic custodial violence, often facilitated by inadequate infrastructure and a lack of formalized training in ethical techniques. In contrast to international standards as well as constitutional guidelines, interrogation in India remains heavily reliant on confessional and often coercive practices. To address this, the National Human Rights Commission published a manual that outlines guidelines for police officers to maintain human rights in the investigation process (National Human Rights Commission, 2011).

Despite efforts to curb coercion, Indian police continue to prioritize confessions over cognitive interviews or evidence-based questioning. According to the Status of Policing in India Report 2023 (Common Cause & CSDS, 2023), a significant number of police stations still lack basic interrogation facilities, such as soundproof rooms or functional CCTV systems. This infrastructure gap directly undermines efforts to adopt scientific models like the **Cognitive Interview (CI)**, which require a controlled, distraction-free environment for effectiveness. Cognitive Interview is a structured, evidence-based technique that relies on memory retrieval strategies that reduce stress, while improving the accuracy and richness of information elicited from victims, witnesses, and even suspects (Dickinson et al., 2019). The emphasis of this technique is to discourage the use of coercion. It is also endorsed by national-level bodies such as the National Human Rights Commission (National Human Rights Commission & British Council, 2002).

Keeping in view the changing global scenario, India has also embarked upon modernizing its investigation protocols. With the new criminal laws, several previously used techniques were removed, replaced, or reformed. The Bharatiya Nagrik Suraksha Sanhita (BNSS) 2023 replaced the Code of Criminal Procedure (CrPC), 1973. In this context, Sections 179 to 182 of BNSS, 2023are of particular significance, as they are related to examinations of individuals who are familiar with the facts of any case under investigation, as well as procedures for taking and recording statements (Ministry of Law and Justice, Government of India, 2023, §§ 179–182).

In particular, Section 179 empowers the investigating officer to examine orally any such person, including victims, witnesses, and suspects, while Sections 180–182 regulate how these statements are recorded and used. In particular, Section 179 emphasizes that interviews must

be victim-centric, while also explicitly putting in place protections for vulnerable persons. More importantly, Section 180 makes provision for audio-video recording of the given statement. It also states that individuals are duty-bound to be truthful while answering questions, other than self-incriminating ones (ensuring Article 20(3) does not get violated). Sections 181 and 182 provide safeguards for people by stating that they shall not be intimidated or compelled to make a statement, and the use of statements given to police will be for investigative purposes, not for direct conviction.

Yet, the uneven state of interview rooms in India—many lacking standardized, secure, or CCTV equipped spaces—creates a gap between the code's progressive framework and the realities of custodial questioning, especially in stations without reliable digital infrastructure.

STATE OF INTERVIEW ROOMS

The absence of standardized, secure, and transparent interviewing spaces is a structural barrier to police reform. As of January 2022, 73.5% of police stations had functioning CCTV cameras (Common Cause & CSDS, 2023); however, there is no data about the overall extent of the installed CCTVs, limiting both oversight and accountability. At the same time, the presence of CCTV cameras has a positive effect on public opinion. According to the SPIR 2023 report, 44% of respondents from the general public believe that the presence of CCTV cameras is helpful to a great extent in preventing human rights violations against individuals in custody (Common Cause & CSDS, 2023).

Judicial directives have attempted to address this. In Paramvir Singh Saini v. Baljit Singh (2020), the Supreme Court mandated CCTV installation in all police stations and agencies like the CBI and NIA. However, implementation remains uneven, with major urban centers like Delhi and Raipur seeing limited advancements, while rural and semi-urban regions lag behind.

CASE STUDIES AND THE CASE FOR REFORM

Each of the following case studies underscores specific gaps in India's custodial framework and the urgent need for standardized, ethical interview rooms:

1. **Nandini Satpathy v. P.L. Dani (1978)**

   This landmark judgment emphasized the right against self-incrimination under Article 20(3) of the Constitution. The Court ruled that suspects cannot be forced to answer questions that may incriminate them, especially in the absence of legal counsel (Nandini Satpathy v. P.L. Dani, 1978). This case underlines the necessity of safe, private, and legally compliant interview spaces—particularly for vulnerable individuals.

   Implication: Interview rooms must be equipped with legal access provisions and designed to uphold constitutional protections.

2. **D.K. Basu v. State of West Bengal (1997)**

   A cornerstone in protecting detainees from custodial violence, this case laid down detailed

safeguards for arrest and interrogation, such as the presence of a lawyer, medical examinations, and prompt communication with relatives (D.K. Basu v. State of West Bengal, 1997). These mandates remain difficult to enforce without physical spaces that facilitate observation and documentation.

Implication: Modern interview rooms should support procedural safeguards through real-time surveillance and documentation features.

3. **Govardhan Singh v. State of Rajasthan (2022)**

   This case questioned the legality of using production warrants for custodial interrogation when earlier closure reports had been filed. The Rajasthan High Court emphasized that custodial interrogations must rest on strong procedural legitimacy (Govardhan Singh v. State of Rajasthan, 2022).

   Implication: Interview room use must be rule-bound, transparent, and fully documented to withstand judicial scrutiny.

4. **Paramvir Singh Saini vs Baljit Singh (2020)**

   Paramvir Singh Saini vs Baljit Singh is a landmark judgment in which the Supreme Court has given clear directions to the law enforcement agencies about the installation, maintenance, and utilization of CCTV facilities in the Police Stations. The aim was not simply to become more technologically advanced, but also to ensure oversight regarding issues stemming from a lack of electronic evidence when faced with allegations of custodial torture or human rights violations. The judgment reinforces the constitutional right to life and liberty by emphasizing police accountability and safeguards against misconduct.

   Implication: Creating a consistent national policy for CCTV use in police stations, requiring extended retention of footage, setting up independent oversight bodies, and promoting video recordings as a crucial means to prevent custodial abuse.

CONSTITUTION OF OVERSIGHT COMMITTEES AND FURTHER COMPLIANCE

To ensure transparency in custodial settings, the Supreme Court in Paramvir Singh Saini v. Baljit Singh (2020) mandated the establishment of multi-tiered oversight committees for monitoring CCTV installation and use in all police stations and interrogation rooms. These include Central, State, and District-level Oversight Committees (COB, SLOC, DLOC), each responsible for supervising installation, maintenance, data storage, and independent review of footage. However, multiple judicial audits and investigations have revealed serious implementation lapses. For instance, the Punjab & Haryana High Court (2024) noted that district committees were largely inactive, and many police stations lacked basic video-audio functionality (Punjab & Haryana High Court, 2024). Similarly, the Madhya Pradesh High Court found that CCTV footage was either unavailable or poorly maintained in key investigations, undermining procedural fairness (Madhya Pradesh High Court, 2024).

Information Commissions in states like Madhya Pradesh further reported widespread denial of RTI access to footage, with over 80% of cases citing technical failure or deletion (Naveen, 2023). These findings demonstrate that while the oversight framework exists on paper, its operational

integrity remains compromised due to poor funding, weak accountability, and non-functional committees.

FINDINGS AND DISCUSSION

1. Interview Rooms are Largely Absent or Inadequate in India

In the Revision of Standards for Modern Police Station Buildings (2016), Bureau of Police Research and Development (BPR&D), as well as MHA (Ministry of Home Affairs, 2017), have clearly stated that an interview room must be provided across all police stations, and they have also made funds available for the same. However, no published government or private report provides the current number of established interview rooms across Police Stations. This reflects a systemic lack of interview/interrogation infrastructure. Such inadequacies compromise transparency, increase the risk of custodial violence, and make it difficult to implement non-coercive, evidence-based interviewing methods like PEACE or Cognitive Interview.

2. Judicial Mandates Exist, but Implementation is Uneven

Supreme Court rulings such as Paramvir Singh Saini v. Baljit Singh (2020) and earlier precedents like D.K. Basu v. State of West Bengal (1997) have laid down robust procedural safeguards. Yet, their enforcement is inconsistent. In the last three consecutive years, the number of Police Stations with CCTVs has increased from 11,837 in 2021 (BPR&D, 2022a) to 12,893 in 2022 (BPR&D, 2022b) to 14,865 in 2023(BPR&D, 2024) (see figure). However, according to the SPIR, 2023 (Common Cause & CSDS, 2023, p. 64), based on data from the states that responded to an RTI filed by the authors, only 32.9% of police stations in India have functional CCTVs. Facilities in elite agencies like the CBI or special police units in metro cities do reflect compliance, but this is far from the national norm. At the same time, case law such as Govardhan Singh v. State of Rajasthan (2022) further illustrates judicial discomfort with irregular or coercive custodial practices.

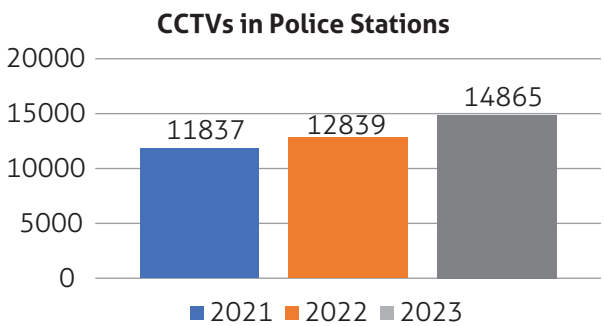


Figure 1: Increase in number of CCTVs in Police Stations

3. Police Officers Acknowledge the Benefits but Remain Skeptical

A study on serving police officers in various countries in Europe showed that police officers report having a preference for a specifically designed interviewing space, which enables them to establish rapport with the suspects (Hoogesteyn et al, 2022b). Focused Group Discussions with serving police officers show that in India too, officers are aware of the need for systemic capacity building in order to make the most out of technology such as CCTVs (Common Cause & CSDS, 2023). This underscores the need for comprehensive training and cultural shifts within the police force.

4. **Public Support for Reform is Growing**

   SPIR 2023 highlights that nearly 50% of respondents support mandatory CCTV recording of interrogations (Common Cause & CSDS, 2023), and only 16% believe police are adequately trained in using surveillance tools. This public sentiment signals a demand for more transparency, accountability, and modernization in investigative processes. As has been previously stated, 44% of individuals believe that human rights violations against people in custody may be prevented by the presence of CCTV cameras in areas of custody (Common Cause & CSDS, 2023), indicating that the public is accepting of reforms in the sphere of electronic recording systems when they are used for the betterment of society.

5. **Physical Environment Influences Interrogation Outcomes**

   Research (Meissner et al., 2023; FBI, 2016) confirms that interrogation environments directly affect suspect behavior, stress levels, and disclosure quality. This evidence establishes a clear link between physical infrastructure and the ethical conduct of interrogations. It also further makes a case for the quality of interviews (e.g., collection of clear, definite facts relevant to the case) having an effect on the overall quality of the investigation.

6. **Improvement in Conviction Rates**

   As has been directed by the Hon'ble Home Minister, Shri Amit Shah, efforts must be made to increase conviction rates by at least 20% (News On Air, 2025). Ensuring that interview rooms are properly equipped with audio-video recording capacity and other standardised infrastructure, can make investigations more transparent and evidentially robust. Since the abovementioned point states how interview rooms can affect disclosure quality, it can be further inferred that such disclosures will, in turn, determine the quality and speed of investigations, helping the police officers in generating new and trustworthy investigative leads, leading to a robust case ready for prosecution, thus, culminating in higher conviction rates.

7. **Safeguard for Police Officers**

   Police officers routinely interact with vulnerable individuals, and they often need to handle sensitive situations with discretion. In doing so, they may face allegations of excessive force even when acting within legal bounds. Such accusations, whether accurate or not, can erode public trust, making communities less willing to cooperate. This loss of trust hampers investigations, undermines the morale of officers, and impedes the delivery of justice. However, if police stations are equipped with functioning CCTV systems as well as proper interview rooms, it can help verify officers' conduct, reduce false allegations, and provide a layer of protection for both officers and detainees. This, in turn, can ease institutional pressure and allow officers to carry out their duties with greater confidence and transparency.

8. **Ensuring the well-being of victims:**

   Victims of crime routinely enter the justice system in a state of acute vulnerability and require a highly sensitive approach. In navigating the investigative process, they often face stark, intimidating environments that can inadvertently exacerbate their emotional distress. This psychological strain hampers investigations, making it difficult to gather accurate and comprehensive evidence. However, if police stations are equipped with standardized interview

rooms paired with comprehensive audio-video recording technology, these spaces not only ensure that the victim's narrative is accurately captured, but also s/he can be confident of a fair and professional investigation vis-à-vis the accused, safeguarding the victim's long-term mental well-being.

THE ROAD AHEAD: BRIDGING GAPS THROUGH STANDARDIZATION

India's journey towards standardized interview rooms requires more than infrastructure. It necessitates policy integration, training, and judicial oversight. Officers must be trained in ethical, science-based interrogation techniques such as the PEACE model or the Cognitive Interview, and police stations must be uniformly equipped.

According to the Revision of Standards for Modern Police Station Buildings (BPR&D, 2016), certain guidelines have been established for setting up Police Stations in India. Police stations are expected to mandatorily install CCTV systems in all important areas, including lockups, waiting rooms, suspect examination rooms, etc. There are also clear guidelines about data storage and retrieval that should enable transparency, security, and accountability. The Supreme Court in Paramvir Singh Saini v. Baljit Singh (2020) landmark judgment has clearly stated that CCTV data must be maintained for up to 18 months. Noting this statement, the Madras High Court in the matter of Saravana Balagurusamy vs SP of Dindugal District in 2022 (Narendran, 2022), and Jharkhand High Court in the matter of Propertymen Realty Pvt. Ltd. & Ors. v. The State of Jharkhand & Ors. in 2023 (Singh, 2023) had also directed the respective state police forces to maintain CCTV recordings for a period of 18 months.

Utilization of CCTVs is the very first step towards transparency, which further translates into developing an interview room infrastructure. The absence of primary requirements like CCTVs indicates how much more work needs to be done for establishing a standardized infrastructure that can aid in investigation.

The Indian Police are making huge strides towards being a scientific, modern law enforcement organization. While adopting technological advances, we also need to ensure that we undergo a culture change, right at the policy level, where investigations move from the confession-driven approach to a rights-oriented, trauma-informed, information-gathering approach. This entails systematic training in scientific and humane interrogation techniques, alongside institutional safeguards such as mandatory CCTV and audio-video recording of custodial processes.

On similar lines, there is a need to establish guidelines for the standardization of interview rooms in all police stations across India. The following guidelines are hereby proposed:

- Specific rooms in Police stations must be earmarked for the purpose of conducting interrogations/interviews of suspects, victims, and witnesses.
- Interview rooms may not be sterile, but must have clean walls, devoid of any distracting objects, or images, etc.
- These rooms should not have any unnecessary paraphernalia that may be used by the suspect to cause harm to himself/herself or to others.

- Interview rooms must be equipped with a large table and a sufficient number of chairs. The table must have a provision for attaching the handcuffs of suspect(s) to a handle or a horizontal bar.
- Interview rooms must have a one-way mirror or one-way glass enabling authorities to view and guide the proceedings of the interviews from an adjacent room without being observed by the suspect(s).
- It must have CCTV coverage from multiple angles, along with a microphone, sound system, and a video camera for the audio and video recording of the entire interview session.
- A comprehensive policy must be developed to mandate high-resolution CCTV footage, define the duration for which recordings—especially those related to sensitive cases—are to be preserved, and specify the authorized personnel permitted to access the stored footage.
- Data security and integrity must be maintained entirely. Data protection and access rules need to be clearly established.

Only through this multi-pronged approach can India align with international norms and uphold constitutional principles in its investigative processes.

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Forensic Science: From Clues to Conviction





A Multidisciplinary Review for Law Enforcement and Criminal Justice

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ABSTRACT

This review outlines the foundational and evolving role of forensic science within India's criminal justice system, tracing its history from ancient traditions to contemporary practice. It synthesizes diverse core disciplines—such as pathology, DNA profiling, and cyber forensics—while establishing strict, field-oriented protocols for evidence preservation and chain of custody. A primary focus is placed on the Naveen Nyaya Sanhita, 2023 and the E-Sakshya platform, which legally mandate forensic involvement in serious offenses and establish digital records as primary evidence. Through real-world case studies, the text demonstrates how multidisciplinary scientific evidence converges to build robust, irrefutable prosecution narratives. Ultimately, it balances the potential of emerging technologies like AI and virtual autopsies against critical systemic challenges, including severe case backlogs and personnel shortages.

Keywords: *Forensic Science, Chain of Custody, Bhartiya Nagarik Suraksha Sanhita (BNSS), E-Sakshya, DNA Profiling, Cyber Forensic, Dactyloscopy, Forensic Pathology, Evidence Contamination, Multidisciplinary Integration*

1. INTRODUCTION

Forensic science can be described as the structured application of scientific principles, analytical methods, and investigative techniques to questions arising within the legal system. Earlier, referred to by broader expressions such as legal medicine or state medicine, the discipline has progressively matured into a specialised and essential component of contemporary criminal justice. Its significance lies in its role as an interface—bridging observable physical evidence at a crime scene with the factual conclusions that guide judicial decision-making.

Importantly, forensic science is not restricted to laboratory-based analysis. Rather, it establishes an objective and systematic framework through which suppositions, allegations, and unverified narratives are converted into evidence that satisfies both scientific standards and legal admissibility. A central doctrine governing the discipline is that every criminal act results in the transfer of

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material traces. This principle operates irrespective of the sophistication of the offence. Such traces may be readily visible, including bloodstains or broken objects, or may exist at a microscopic level, such as epithelial cells deposited through brief physical contact. The fundamental objective of forensic science is to enable investigators to detect, collect, preserve, examine, and interpret these traces in a manner that is scientifically credible and legally sustainable.

The evidentiary strength of a criminal case is frequently determined at the earliest stages of handling material evidence. Errors introduced during initial response—such as contamination, improper packaging, or incomplete documentation—can irreversibly compromise subsequent analysis. For this reason, a functional understanding of forensic principles among first responders, police officers, and medical practitioners is indispensable. Their actions directly influence the evidentiary value of material presented in court. This review is intended to provide a detailed, field-oriented exposition of forensic science for professionals engaged in policing, law enforcement, and criminal justice administration.

2. HISTORICAL OVERVIEW: A BRIEF PERSPECTIVE

The intellectual roots of forensic reasoning in India extend back to ancient civilizations. Classical works such as Kautilya's Arthashastra (4th Century BCE) document systematic approaches to crime detection, including identification of poisons, interrogation strategies, and evidentiary reasoning. These early references reflect a structured reliance on observation and logic in legal processes, indicating that empirical thinking has long been embedded within Indian judicial traditions.

The organized development of forensic science as an institutional discipline began during the colonial period. One of the earliest recorded events in this context was the medico- legal autopsy conducted by Dr. Edward Bulkily in 1693. This was followed by the establishment of the Chemical Examiner's Laboratory in Madras in 1849, which marked the beginning of formal scientific analysis in criminal investigations. A major advancement occurred in 1897 with the introduction of fingerprint identification as a systematic method of personal identification. This development was made possible through the contributions of Sir Edward Henry, Hem Chandra Bose, and Azizul Haque. The Henry Classification System, formulated in India, subsequently gained global acceptance and continues to form the basis of fingerprint identification systems worldwide.

Following independence, India undertook significant steps to establish a structured forensic infrastructure. The creation of the Central Forensic Science Laboratory (CFSL) in Calcutta in 1952 represented a key milestone. This initiative was expanded through the development of State Forensic Science Laboratories across the country.

The late twentieth century witnessed further advancement with the introduction of DNA profiling techniques between 1989 and 1991. Judicial acceptance of DNA evidence in 1998 strengthened its evidentiary value. More recently, the enactment of the DNA Technology (Use and Application) Regulation Act, 2023, has provided a statutory framework governing the collection, storage, and use of DNA data. At present, forensic science in India is characterized by the integration of

molecular biology, digital technologies, and multidisciplinary collaboration across investigative domains.

3. MAJOR BRANCHES OF FORENSIC SCIENCE

Forensic science is not a single discipline but a composite field comprising multiple specialised branches, each addressing a specific category of evidence. These domains function both independently and in coordination, contributing collectively to the reconstruction of events and establishment of factual conclusions in criminal investigations.

3.1. Forensic Pathology

Forensic pathology is primarily concerned with the medico-legal examination of the deceased for the purpose of establishing three key parameters: cause of death, manner of death, and estimation of the post-mortem interval. This is achieved through a systematic autopsy that includes detailed external inspection, internal organ examination, and assessment of post-mortem changes such as rigor mortis, lividity, and decomposition.

Beyond the determination of cause, forensic pathology plays a critical interpretative role. It assists in identifying concealed injuries, distinguishing between ante-mortem and post-mortem trauma, and evaluating inconsistencies in witness statements. In cases where deaths are staged, or circumstances are unclear, pathological findings provide an objective reconstruction of the terminal sequence of events.

3.2. Forensic Toxicology

The discipline of forensic toxicology deals with the detection, identification, and quantitative estimation of toxic substances within biological systems. These substances may include agricultural chemicals, heavy metals, pharmaceutical agents, narcotics, or other xenobiotics.

Biological specimens commonly analysed include blood, urine, vitreous humour, gastric contents, liver tissue, and hair. The choice of sample depends on the suspected toxin and the time elapsed since exposure. Toxicological analysis is essential in cases of suspected poisoning, overdose, drug-facilitated crimes, and unexplained deaths where chemical influence is a possibility. Interpretation of results requires correlation with clinical findings, post-mortem changes, and circumstantial evidence.

3.3. Forensic Biology and Serology

This branch focuses on the examination of biological materials recovered from crime scenes. Such materials include blood, semen, saliva, epithelial cells, hair, and other tissue fragments. Initial analysis typically involves serological techniques to determine species origin and blood group characteristics.

In addition to identification, biological evidence provides insight into the dynamics of a crime. For example, the presence, distribution, and pattern of biological stains can indicate mechanisms of injury, direction of force, and sequence of events. Even minute quantities

of biological material can establish contact between individuals or link a suspect to a specific location.

3.4. DNA Fingerprinting

DNA profiling represents one of the most powerful tools in forensic science. It is based on the analysis of polymorphic regions within the genome, particularly Short Tandem Repeats (STRs), using Polymerase Chain Reaction (PCR) techniques. These regions exhibit high variability among individuals, allowing the generation of unique genetic profiles.

One of the major advantages of DNA analysis is its ability to work with extremely small, degraded, or mixed samples. Applications include identification of suspects, exclusion of individuals, paternity testing, and identification of unknown remains. Statistical interpretation of DNA matches provides a quantifiable measure of evidentiary strength, making it highly reliable in judicial contexts.

3.5. Fingerprint Science (Dactyloscopy)

Fingerprint analysis is based on the principle that ridge patterns on the fingers are unique and remain unchanged throughout life. Prints encountered at crime scenes may be classified as latent (invisible), patent (visible), or plastic (impressed in soft material).

Various physical, chemical, and optical techniques are employed to develop and visualize latent prints. Once developed, prints are compared based on ridge characteristics such as bifurcations, endings, and islands. A single high-quality fingerprint can establish the presence of an individual at a crime scene and directly associate them with objects such as weapons or documents, often serving as conclusive evidence.

3.6. Forensic Ballistics

Forensic ballistics deals with the examination of firearms and ammunition, as well as the analysis of their effects. This includes the study of bullets, cartridge cases, gunshot residue, and firing patterns.

Ballistic analysis assists in determining the type of weapon used, the range of firing, and the trajectory of projectiles. It also helps differentiate between suicidal, accidental, and homicidal firearm injuries. Matching of bullets and cartridge cases to a specific weapon is achieved through microscopic comparison of striation patterns, which are unique to each firearm.

3.7. Forensic Anthropology

Forensic anthropology is concerned with the examination of skeletal remains to establish a biological profile of the deceased. Parameters such as age at death, sex, stature, and ancestral background are estimated using osteological methods.

This field becomes particularly important in situations where bodies are decomposed, skeletonised, or otherwise unrecognizable. It is also extensively used in mass disaster scenarios. In addition to identification, anthropological analysis can provide

information regarding trauma, including evidence of fractures, weapon-related injuries, and post-mortem alterations.

3.8. Forensic Odontology

Forensic odontology utilizes dental structures for identification purposes. Teeth are highly durable and can withstand extreme conditions such as fire, decomposition, and environmental exposure, making them valuable in cases where other identification methods fail. Identification is achieved by comparing ante-mortem dental records with post-mortem findings. Bite mark analysis may also be used as supportive evidence, particularly in cases of assault or abuse. However, interpretation requires caution and must be corroborated with other forms of evidence.

3.9. Forensic Psychology and Criminology

Forensic psychology focuses on understanding the mental processes, behavioral patterns, and motivations of offenders. It includes assessment of cognitive state, intent, and personality traits. Criminology, in contrast, examines broader patterns of criminal behavior, including social, environmental, and economic factors influencing crime.

Together, these disciplines contribute to behavioral profiling, which is particularly useful in serial offences or cases where physical evidence is limited. Such profiling assists investigators in narrowing suspect pools and understanding offender behavior.

3.10. Cyber Forensics

Cyber forensics involves the investigation and analysis of digital evidence obtained from electronic devices and network systems. This includes computers, mobile phones, servers, cloud storage, and online communication platforms.

The process involves recovery of deleted data, analysis of digital logs, identification of communication patterns, and tracing of IP addresses. It also includes malware analysis and examination of encrypted data. With the increasing digitization of society, cyber forensics has become indispensable in investigating financial fraud, cybercrime, identity theft, and digital exploitation.

4. NEW CRIMINAL LAWS AND THEIR FORENSIC IMPLICATIONS

The year 2023 marked a major legislative transition in India's criminal justice system with the introduction of three key enactments: the Bharatiya Nyaya Sanhita, 2023, the Bharatiya Nagarik Suraksha Sanhita, 2023, and the Bharatiya Sakshya Adhiniyam, 2023. These statutes collectively replace earlier legal frameworks and significantly strengthen the role of scientific evidence in criminal investigations and trials.

Rather than treating forensic science as an auxiliary component, these laws position it as a foundational element within investigative procedure and evidentiary assessment.

4.1 Bharatiya Nyaya Sanhita, 2023

(Replacement of the Indian Penal Code)

- The Bharatiya Nyaya Sanhita, 2023 incorporates provisions that explicitly emphasise the necessity of scientific evidence, particularly in serious and complex offences. It establishes a framework in which forensic corroboration is expected at early stages of investigation.
- Offences relating to organized crime and terrorism now require systematic collection and preservation of scientific evidence as part of the investigative process.
- In the context of sexual offences, including aggravated forms such as gang rape (Sections 63–70), medico-legal examination and biological evidence collection are no longer discretionary but form an integral procedural requirement.
- Crimes involving digital identity misuse, impersonation, and electronic records necessitate the application of digital forensic analysis as a primary investigative tool.
- A significant procedural shift introduced by the Bharatiya Nyaya Sanhita, 2023 is the obligation placed on investigating officers to document the forensic steps undertaken during the course of the investigation. This requirement enhances transparency and ensures that evidentiary handling can be scrutinized during judicial proceedings.

4.2 Bharatiya Nagarik Suraksha Sanhita, 2023

(Replacement of the Code of Criminal Procedure)

- The Bharatiya Nagarik Suraksha Sanhita introduces several procedural mandates that directly influence how forensic evidence is collected and preserved.
- Under Section 176, forensic examination of crime scenes becomes compulsory in offences punishable with imprisonment of seven years or more. Where state-level facilities are insufficient, provision is made for obtaining assistance from other accredited forensic institutions.
- Section 185 empowers Magistrates to direct the forensic examination of accused individuals, including the collection of biological samples, subject to prescribed legal safeguards.
- The law mandates video recording of key investigative processes, including crime scene examination and recording of statements, thereby creating a verifiable digital record.
- The concept of Zero FIR, when combined with mandatory forensic involvement, ensures that evidence collection is not delayed due to jurisdictional uncertainties at the time of reporting.
- Through these provisions, forensic examination is no longer optional in serious offences but becomes a statutory obligation, thereby standardizing investigative practices.

4.3 Bharatiya Sakshya Adhiniyam, 2023

(Replacement of the Indian Evidence Act)

- The Bharatiya Sakshya Adhiniyam modernizes the evidentiary framework by expanding the admissibility and relevance of scientific and digital evidence.

- Electronic records, including data from mobile devices, computer systems, and cloud-based platforms, are recognized as primary evidence, reducing earlier procedural barriers.
- Section 63 introduces a streamlined certification process for electronic evidence, replacing the more complex requirements that existed under the previous legal regime.
- Expert testimony in areas such as DNA analysis, digital forensics, toxicology, and ballistics is accorded enhanced evidentiary value, with courts empowered to scrutinize such evidence in greater detail.
- The statute explicitly recognizes audio-visual recordings, metadata, geolocation information, and other digital artifacts as admissible forms of evidence.
- Taken together, these reforms signal a transition toward a system in which scientific validation forms the core basis of criminal adjudication.

5. E-SAKSHYA: DIGITAL EVIDENCE MANAGEMENT IN THE NEW LEGAL FRAMEWORK

5.1 Overview and Purpose

- E-Sakshya is a digital evidence management system developed under the Ministry of Home Affairs with the objective of facilitating electronic documentation, storage, and transmission of evidentiary material in criminal investigations. It has been designed in alignment with the procedural requirements introduced under the BNSS, particularly those relating to video-recorded investigations.
- The primary aim of this platform is to ensure that digital evidence retains its authenticity and integrity from the point of collection through to its presentation in court.

5.2 Core Functionalities

- The platform incorporates several key features that support forensic and investigative processes:
- Enables video documentation of crime scenes, witness statements, and suspect interactions in compliance with statutory mandates.
- Provides secure cloud-based storage systems equipped with tamper-detection mechanisms, including digital signatures, to maintain authenticity.
- Integrates with existing case management systems used by investigative agencies and courts, thereby improving procedural efficiency.
- Utilises QR code-based tracking mechanisms that allow real-time verification of evidence movement and chain of custody.
- Offers an interface for judicial access, allowing courts to directly view authenticated digital evidence without reliance on physical storage media.

5.3 Significance for Forensic Practice

- E-Sakshya addresses a longstanding limitation within the criminal justice system—namely, the discontinuity between evidence collection and courtroom presentation. By creating a continuous digital record beginning at the point of collection, it strengthens

the evidentiary chain and reduces the likelihood of disputes related to tampering or procedural irregularities.

- For forensic professionals, the platform serves both as a documentation system and as a mechanism that enhances the legal defensibility of evidence. It ensures that scientific findings are supported by a verifiable audit trail, thereby improving their acceptance in judicial proceedings.

6. CHAIN OF CUSTODY: FROM EVIDENCE COLLECTION TO COURT PRESENTATION

The chain of custody refers to the continuous and documented history of possession, handling, and transfer of evidence from the moment it is identified at a crime scene until its final presentation before a court of law. It represents both a procedural and evidentiary safeguard, ensuring that the material produced in court is the same as that originally recovered. Any break, inconsistency, or undocumented transfer within this chain can raise legitimate doubts regarding contamination or tampering, thereby weakening the evidentiary value.

6.1 Initial Stage: Recognition and Securing of the Crime Scene

The process begins even before the physical collection of evidence. The responsibility lies with the first responding officer to ensure:

- Establishment of a clearly demarcated perimeter using physical barriers
- Restriction of access exclusively to authorized personnel
- Maintenance of an entry-exit register documenting identity, designation, and time of entry/exit
- Mandatory use of protective equipment such as gloves, masks, and shoe covers to prevent contamination
- Comprehensive photographic and videographic documentation of the scene in its undisturbed state
- Under current legal provisions, particularly those introduced in 2023, such documentation is no longer optional but forms part of statutory compliance in serious offences.

6.2 Evidence Identification and Documentation

Before any item is collected, it must be systematically recorded:

- Photographed in its original location with appropriate scale indicators
- Mapped within a scene sketch showing spatial positioning
- Assigned a unique identification number that remains consistent throughout the investigative process
- Described in written records with attention to condition, orientation, and surrounding context

6.3 Evidence Collection Procedures

Collection techniques vary depending on the nature of the evidence and must strictly adhere to scientific protocols.

Biological Evidence:

- Blood, semen, saliva, and hair samples are collected using sterile, single-use instruments. Wet samples must be dried before packaging, and breathable containers such as paper envelopes are preferred to prevent degradation.

Trace Evidence:

- Materials such as fibers, glass fragments, and soil are collected using forceps, adhesive lifts, or filtered vacuum devices. Each item is packaged separately to avoid cross-contamination.

Digital Evidence:

- Electronic devices are seized without altering their power state. They are placed in Faraday bags to block external signals. A forensic image is created prior to analysis to preserve original data integrity.

Firearms and Related Evidence:

- Weapons are handled with caution, photographed prior to manipulation, and unloaded by trained personnel. Gunshot residue samples are collected promptly, ideally within a few hours.

6.4 Packaging and Labeling

Each piece of evidence must be secured using tamper-evident seals and labeled with:

- Unique exhibit number
- Date, time, and location of collection
- Identity and signature of the collecting officer
- Description of the item
- For sensitive materials, double-layer packaging is recommended. Seals are initialed to ensure any tampering is detectable.

6.5 Transportation

Evidence must be transported under conditions appropriate to its nature:

- Biological samples requiring preservation are transported in controlled temperature conditions
- A transport log records personnel involved, timings, and the condition of seals
- Continuous supervision is maintained during transit to prevent unauthorized access

6.6 Laboratory Receipt and Registration

Upon arrival at the forensic laboratory:

- Seal integrity is examined and documented
- A laboratory accession number is assigned
- The condition of the evidence is recorded
- Chain of custody documentation is updated to reflect the transfer

6.7 Analytical Phase

During forensic examination:

- Every analytical step is documented, including date, time, and analyst identity
- Sub-samples are assigned derivative identifiers linked to the original exhibit
- The remaining material is preserved for re-examination if required
- Instruments used are maintained under strict calibration and quality control protocols

6.8 Reporting and Court Presentation

- The final forensic report must include:
- Identification of exhibits examined
- Description of condition upon receipt
- Methodology and instruments used
- Objective findings with appropriate interpretation
- Statistical evaluation where relevant
- Limitations or uncertainties in the analysis
- All supporting records must be preserved for potential cross-examination. Courts increasingly rely on chain of custody documentation to assess evidentiary reliability.

7. ROLE OF FORENSIC SCIENCE IN SPECIALIZED CRIMES: INTEGRATED CASE ANALYSIS

The application of forensic science in complex criminal investigations is best understood through integrated case analysis, where multiple forensic disciplines operate in coordination. Modern investigations rarely depend on a single category of evidence; instead, they rely on the convergence of findings from pathology, biology, digital analysis, and trace examination to construct a coherent evidentiary narrative.

7.1 Case Study: Hyderabad Veterinary Doctor Rape and Murder Case (2019)

Background and Case Complexity

On the night of 27th November, 2019, a 26-year-old veterinary doctor disappeared in the vicinity of Shadnagar, Telangana. Within approximately 24 hours, partially charred human remains were recovered beneath a culvert along the Bangalore–Hyderabad highway. The case presented investigators with a multi-layered challenge involving sexual assault, homicidal violence, and deliberate destruction of evidence through burning. Additionally, the presence of multiple geographically distinct but interconnected crime scenes significantly increased investigative complexity.

Stage 1: Crime Scene Identification and Evidence Recovery

Initial response by the Special Investigation Team led to the identification of three primary locations associated with the crime:

- **Primary Recovery Site:** Location where the burnt remains were discovered

- **Vehicle Tampering Site:** Petrol station approximately 27 kilometers away, where the victim's scooter was found disabled
- **Assault Site:** Area identified through reconstruction as the location where the offence occurred

At these locations, investigators collected a wide spectrum of forensic material:

- Calcined bone fragments and residual soft tissue suitable for DNA extraction
- Biological swabs obtained from the body surface and the surrounding substrate
- Burnt clothing fragments, personal belongings, and footwear impressions
- CCTV recordings from multiple sources, including toll booths, fuel stations, and roadside surveillance points
- Call detail records and mobile location data corresponding to the accused
- Tyre impression patterns consistent with a transport vehicle

Stage 2: Multidisciplinary Forensic Examination

Forensic Pathology

- Autopsy findings established that death resulted from asphyxia occurring prior to exposure to fire. This was a critical determination, as it demonstrated that burning was post-mortem in nature and intended to destroy evidence. Despite significant thermal damage, careful examination revealed ante-mortem injuries consistent with restraint and sexual assault.

DNA Profiling

- Biological material recovered from the victim's remains and associated exhibits was subjected to DNA analysis. Using STR-based profiling techniques, forensic scientists generated genetic profiles that were compared with reference samples obtained from the accused. The results demonstrated concordance, thereby establishing a direct biological linkage between the suspects and the victim.

Forensic Toxicology

- Toxicological examination was conducted on preserved tissue samples to evaluate the possible presence of intoxicating or incapacitating substances. While not the primary evidentiary component, these findings contributed to understanding the sequence and conditions under which the crime occurred.

Digital Forensics

- Extensive digital analysis played a crucial role in reconstructing the timeline of events:
- Mobile phone records established communication patterns among the accused
- Location data derived from cell tower triangulation placed the suspects at relevant locations
- CCTV footage from more than fifty surveillance points provided visual confirmation of movement

- The integration of these data sources allowed investigators to establish a precise chronological sequence of events.

Trace Evidence Analysis

- Comparative examination of soil samples recovered from the footwear of the accused and samples collected from the crime scenes demonstrated consistency in composition. Additionally, tyre tread impressions found near the body disposal site were matched to the vehicle used by the accused, providing further corroborative evidence.

Stage 3: Evidentiary Integration and Legal Strength

The evidentiary strength of the case did not depend on a single forensic finding but on the convergence of multiple independent streams:

- Pathological evidence established the cause and timing of death
- DNA analysis provided a direct biological linkage
- Digital evidence reconstructed movement and interaction
- Trace evidence connected suspects to physical locations

This convergence created a mutually reinforcing evidentiary framework, significantly enhancing the robustness of the prosecution. The case exemplifies a key principle of modern forensic science: the integration of multiple disciplines yields greater evidentiary reliability than isolated findings.

7.2 Case study: The Cosmos Bank Cyber Attack (2018)

The Cosmos Bank cyber-attack is considered one of the most significant banking cyber-crimes in India. The attack demonstrated how organized cybercriminals can exploit vulnerabilities in banking infrastructure to conduct large-scale financial fraud across multiple countries within a short period.

Introduction

In August 2018, Cosmos Bank, headquartered in Pune, Maharashtra, suffered a sophisticated cyber-attack in which hackers stole approximately ₹94 crore (around USD 13.5 million at the time). The attackers compromised the bank's ATM switch server and carried out fraudulent transactions globally.

The incident highlighted major concerns regarding:

- Banking cybersecurity
- Malware attacks
- ATM network vulnerabilities
- SWIFT system security
- Digital forensic investigation
- International cybercrime coordination

Nature of the Cyber Crime

The attackers used:

- Malware intrusion
- Server compromise
- ATM switch manipulation
- Unauthorized SWIFT transactions
- Cloned debit cards

Modus Operandi (Method Used by Criminals)

Step 1: Malware Infection: Hackers infiltrated the bank's internal network using malware. The malware targeted the ATM switch server.

The ATM switch:

- Verifies debit card transactions
- Connects ATMs with banking databases
- Approves or rejects withdrawals

Once compromised, the attackers gained the ability to authorize fake transactions.

Step 2: Disabling Authentication Controls

The malware manipulated the authorization system so that:

- Transactions were approved without proper verification
- Debit card withdrawal limits were bypassed
- Fraudulent withdrawals appeared legitimate

Step 3: Creation of Cloned Cards

The criminals created cloned Visa and RuPay debit cards using stolen card data. These cards were distributed internationally.

Step 4: Global ATM Withdrawals Within a few hours:

- Thousands of ATM withdrawals occurred
- Transactions were conducted in 28 countries
- Approximately 14,000 withdrawals were made
- Countries involved included:
    1. Canada
    2. Hong Kong
    3. India
    4. United Kingdom
    5. United States

Step 5: SWIFT Transfer Fraud

Apart from ATM fraud, attackers also:

- Used the SWIFT banking network

- Transferred nearly ₹13.9 crore to foreign bank accounts
- This demonstrated a second layer of compromise involving international banking systems.

Investigation

The investigation involved multiple agencies:

- Pune City Police
- Reserve Bank of India
- CERT-In
- International financial intelligence agencies

Digital forensic experts examined:

- Server logs
- Signatures
- ATM transaction records
- SWIFT message trails
- IP addresses
- Network traffic

Digital Forensic Findings

- Investigators found that malware was installed in the ATM switch server; this allowed fake approvals of withdrawal requests. Log manipulation occurred
- Some records were altered to delay detection
- Coordinated international operation
- Cash withdrawals occurred almost simultaneously in multiple countries
- Use of mule accounts
- Stolen money was routed through intermediary accounts to hide the identity of criminals

Significance of the Case

This case became important in India because it:

- Demonstrated vulnerabilities in banking infrastructure
- Highlighted the importance of cyber forensics
- Encouraged stronger RBI cybersecurity guidelines
- Showed the global nature of cybercrime
- Emphasized rapid incident response mechanisms

Conclusion

The Cosmos Bank cyber-attack remains one of India's most notable banking cybercrime

cases. It illustrated how sophisticated hackers can exploit weaknesses in digital banking systems to execute coordinated international fraud.

The case also reinforced the importance of:

- Cybersecurity governance
- Digital forensic readiness
- International cooperation
- Continuous monitoring of banking infrastructure

As India increasingly adopts digital banking and electronic transactions, such incidents underline the critical need for robust cyber defence systems and trained cyber forensic investigators.

7.3 Application in Other Specialized Crime Domains

Organized Crime and Narcotics

- Forensic chemistry enables the identification and quantification of seized substances, particularly under narcotics legislation. Digital forensics assists in mapping communication networks and financial flows, while ballistic evidence may establish linkages between firearms used across multiple incidents.

Cybercrime

- Investigation of cyber offences relies heavily on digital forensic analysis of devices, servers, and network infrastructure. Recovery of deleted files, examination of logs, and metadata analysis enable attribution even when offenders attempt anonymisation.

Economic and Financial Offences

- Forensic accounting, document examination, and digital audit trails form the evidentiary backbone in cases involving fraud, forgery, and financial misrepresentation. Maintaining a verifiable digital chain of custody is critical in such cases.

Terrorism and Explosive Incidents

- Post-blast investigations involve systematic recovery and analysis of explosive residues, device fragments, and blast patterns. Forensic chemistry identifies explosive composition, while digital evidence provides insight into planning and communication networks.

8. EMERGING TECHNOLOGIES IN INDIAN FORENSIC SCIENCE

The evolution of forensic science is increasingly driven by technological innovation, enabling more precise, efficient, and comprehensive investigations.

8.1 Artificial Intelligence and Machine Learning

AI is being deployed as a decision-support system across forensic domains:

- Fingerprint matching systems enhanced with machine learning improve accuracy in partial or degraded prints

- Facial recognition technologies assist in identifying suspects from surveillance data
- Pattern recognition algorithms are used in bloodstain analysis
- Large-scale communication datasets are processed using natural language processing.

However, concerns regarding algorithmic bias and transparency must be addressed to ensure judicial acceptability.

8.2 Virtual Autopsy (Virtopsy)

Virtual autopsy utilizes imaging techniques such as CT and MRI to perform a non-invasive examination. It allows:

- Preservation of the body without dissection
- High-resolution visualization of internal injuries
- Reconstruction of projectile trajectories
- Remote expert consultation

8.3 Advanced DNA Technologies

Recent advancements include:

- DNA phenotyping for predicting physical traits
- Rapid DNA systems capable of near real-time profiling
- Mitochondrial DNA analysis for degraded samples
- Establishment of national DNA databases

8.4 Blockchain-Based Evidence Management

- Blockchain technology enables the creation of immutable records of evidence handling. Each interaction with evidence is time-stamped and cannot be altered, thereby strengthening the chain of custody documentation.

8.5 Drone and Remote Sensing Applications

Drones equipped with imaging and sensing technologies are used for:

- Mapping large or inaccessible crime scenes
- Creating 3D reconstructions
- Detecting buried evidence using specialized sensors

8.6 Cryptocurrency and Financial Tracking

- Specialized forensic tools are used to trace cryptocurrency transactions, identify wallet ownership, and track financial flows associated with criminal activity.

8.7 Mobile and Cloud Forensics

- Modern forensic tools enable the extraction and analysis of data from smartphones and cloud platforms, including deleted content, communication records, and geolocation data.

8.8 Forensic Geosciences

- Geoscientific techniques such as soil analysis, pollen examination, and ground-penetrating radar assist in establishing geographic linkage and detecting concealed evidence.

9. FUTURE OF FORENSIC SCIENCE IN INDIA

- India is undergoing a transition toward a system where scientific evidence forms the central basis of criminal investigation and prosecution.

  Key Developments
- Expansion of forensic infrastructure at the regional levels
- Standardization of protocols across laboratories
- Increased reliance on interdisciplinary collaboration

  Persistent Challenges
- Backlog of cases delaying forensic reporting
- Shortage of trained personnel
- Ethical concerns related to data privacy and surveillance
- Unequal access to forensic facilities
- The effectiveness of future reforms will depend on addressing these structural challenges.

10. CONCLUSION

Forensic science has evolved into a fundamental pillar of criminal justice. The combined impact of legislative reform and technological advancement has shifted the focus toward objective, evidence-based investigation. The emphasis is now on scientifically verifiable findings rather than reliance on testimonial evidence alone.

Sustained progress will require not only technological advancement but also institutional strengthening, training, and adherence to standardized procedures. The future of criminal justice in India will be determined by the extent to which forensic science is effectively integrated into every stage of investigation and adjudication.

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Interpol's Red Notice System: Legal Framework, Common Grounds for Rejection, and a Practitioner's Guide to Drafting Compliant Requests



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ABSTRACT

Red Notices are INTERPOL's most powerful instrument for locating and provisionally arresting fugitives pending extradition. Yet many requests from member countries are refused or cancelled because they failed to satisfy the conditions prescribed by INTERPOL's Constitution and Rules on the Processing of Data (RPD). This article provides a practitioner's primer on the Red Notice system for Indian law enforcement officers and prosecutors. It examines the constitutional and regulatory framework, surveys the principal grounds on which the Notices and Diffusions Task Force (NDTF) and the Commission for the Control of INTERPOL's Files (CCF) refuse or cancel requests, and offers an operational drafting guide. Drawing on published CCF decision excerpts, the Repository of Practice on Articles 2 and 3 (3rd edition, November 2024), and the author's experience within the NDTF, the article addresses the interface between the INTERPOL and the NCBs, the specific requirements for PMLA-based requests, and the coordination between investigating agencies, the NCB, and prosecuting authorities. The article argues that quality, not volume, must become the benchmark for India's engagement with INTERPOL's notice system.

Keywords: *INTERPOL, Red Notice, NDTF, CCF, Rules on the Processing of Data, Repository of Practice, Article 2, Article 3, Fugitive Economic Offenders, PMLA, International Police Cooperation*

1. INTRODUCTION

Of INTERPOL's nine colour-coded notices, the Red Notice is the instrument that most directly engages the coercive apparatus of member states. Published "in order to seek the location of a wanted person and his/her detention, arrest or restriction of movement for the purpose of extradition, surrender, or similar lawful action,"[1] it circulates globally to all 196 member countries and, where national law so provides, may serve as a basis for provisional arrest. With some 19500

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1. INTERPOL Rules on the Processing of Data [III/IRPD/GA/2011 (2025)], Article 82

Red Notices active worldwide and India requesting around 112 notices in 2025, the instrument is central to India's fugitive-recovery strategy.

The Red Notice is neither self-executing nor freely granted. The NDTF, established in 2016, subjects every request to rigorous legal review before it becomes visible to member states. The CCF, whose decisions became binding on the Organisation from 11th March 2017, provides ex post scrutiny on individual complaint. In 2024, around 272 requests were found not compliant with the relevant rules by the CCF and had directed for deletion of the same from the INTERPOL databases[2]. These are not primarily evidence of systemic abuse; they reflect a quality gap between what member states submit and what INTERPOL's legal framework requires. For Indian law enforcement, closing that gap is the difference between an instrument that functions and one that fails at the moment of operational need.

This article proceeds in four stages: the constitutional and regulatory framework (Part II); the compliance architecture - NDTF, CCF, and Repository of Practice (Part III); the principal grounds for refusal with CCF jurisprudence (Part IV); and India-specific challenges with an operational drafting guide (Part V).

2. THE LEGAL FRAMEWORK

A. Articles 2 and 3 of the Constitution

Two provisions of INTERPOL's 1956 Constitution define the outer boundaries within which every Red Notice must reside. Article 2(1) commits the Organisation to "ensure and promote the widest possible mutual assistance between all criminal police authorities within the limits of the laws existing in the different countries and in the spirit of the Universal Declaration of Human Rights." The UDHR reference is not aspirational: the 2024 Repository of Practice confirms that internationally recognised human rights norms that have attained the status of generally accepted principles are binding constraints on data processing.[3] Article 3 imposes a categorical prohibition: "It is strictly forbidden for the Organization to undertake any intervention or activities of a political, military, religious or racial character." Applying Article 3 to Red Notice requests requires the Organisation to look beyond the formal charge to the underlying facts, the status of persons involved, and the general context of the case - a task that the predominance test, discussed below, is designed to accomplish.

B. The Rules on the Processing of Data: Articles 82–87

The substantive conditions for Red Notices are set out in Articles 82 to 87 RPD. Article 82 defines the purpose. Article 83 prescribes three cumulative minimum criteria:

a) the offence must be a serious ordinary-law crime (excluding offences raising cultural or behavioural controversy, family or private matters, and administrative or private disputes unless linked to serious or organised crime);

2. CCF Annual Activity Reports 2023 (Ref. CCF/130/RAP/1) and 2024 (Ref. GA-2025-93-REP-09 E)

3. INTERPOL, Repository of Practice on the Application of Articles 2 and 3 (3rd edn, November 2024), paras. 15, 19

b) the penalty threshold must be satisfied: where the person is sought for prosecution, the conduct constituting the offence must be punishable by a maximum deprivation of liberty of at least two years, or a more serious penalty; where the person is sought to serve a sentence already imposed, he or she must be sentenced to at least six months of imprisonment and/or there must be at least six months of the sentence remaining to be served; and

c) the request must be of interest for the purposes of international police cooperation.

Article 83 also mandates minimum data: sufficient identity particulars and sufficient judicial data including a summary of facts, charge(s), applicable law, maximum penalty, and a valid arrest warrant. Articles 84 and 85 require the NCB to confirm jurisdictional authority, that extradition will genuinely be sought upon arrest, and that any non-judicial warrant is subject to judicial review. Article 86 imposes a legal review obligation on the General Secretariat. Article 87 prescribes steps to be taken on locating the individual - a provision that has operational consequences if the requesting NCB fails to act.

C. The Specific Offences Exclusion List

Article 83(1)(a)(i) empowers the General Secretariat to maintain a non-exhaustive list of excluded offences. The list, updated in January 2022, identifies three categories:

i) offences raising behavioural or cultural controversy (prostitution, gestational surrogacy, pornography unless facilitating serious crime, honour-related offences, personal drug possession);

ii) family and private matters (adultery, bigamy, homosexual acts, dowry crimes, parental child abduction in specified circumstances, failure to pay maintenance); and

iii) administrative or private disputes (traffic violations, labour law infractions, defamation, driving under the influence without serious harm, abandonment of employment, public-fund damage without personal gain, usury, and issuing unfunded cheques).

For Indian law enforcement officers, the practical consequence is significant: cheque-dishonesty cases under Section 138 NI Act, private commercial disputes framed as cheating or criminal breach of trust, and honour or dowry complaints without a serious-crime nexus are unlikely to survive NDTF review and should not be submitted as Red Notice requests, unless backed by clear and demonstrable criminal intent or explicit evidence of serious violence or hurt.

3. THE COMPLIANCE ARCHITECTURE

A. The Notices and Diffusions Task Force

Member countries are primarily responsible for ensuring their requests comply with INTERPOL rules, national laws and international obligations. In accordance with Articles 22, 74 and 128 of the RPD, the INTERPOL General Secretariat is tasked with examining the compliance of Notices and Diffusions. To reinforce this capacity, in 2016 INTERPOL created a dedicated multidisciplinary team: the Notices and Diffusions Task Force (NDTF)[4]. It is a

4. INTERPOL General Assembly Resolution AG-2015-RES-09 (Kigali, 2015); confirmed in GA-2023-91-RES-10 (Vienna, 2023)

multidisciplinary unit of lawyers, police officers and operational specialists within the General Secretariat, tasked with reviewing every Red Notice and Diffusion request before publication. A submitted request is held in a temporary database - invisible to member states - pending NDTF authorisation[5]. Since 2018, the NDTF has also reviewed legacy notices issued before 2016. When a submission is deficient, the NDTF issues a query to the requesting NCB; failure to respond satisfactorily results in non-publication. The 2025 figures - 193 requests refused on Article 2; 365 requests refused on Article 3 grounds and 1992 on technical or data-quality grounds - show the scale of the filtering function the NDTF performs. A quality red notice request submission that meets Article 83(2)'s data standards avoids the query cycle entirely.

B. The Commission for the Control of INTERPOL's Files

The CCF is an independent body established under Articles 36 and 37 of INTERPOL's Constitution, operating under a Statute in force since 11th March, 2017. The Requests Chamber adjudicates individual complaints, and its decisions are final and binding on the Organisation. Any person subject to INTERPOL data may complain without charge; deletion requests must be decided within nine months of admissibility. The Commission publishes anonymised decision excerpts - spanning 2017 to 2025 - which constitute its operative jurisprudence and are the most authoritative public statement of the compliance standards the Organisation applies.

C. The Repository of Practice on Articles 2 and 3

The third edition of the Repository of Practice on Article 2 and Article 3 (November 2024) is the General Secretariat's authoritative interpretive document, issued under Article 34(4) RPD. Its approach is shaped by two principal guidelines: first, it addresses Article 2(1) compliance as a fully independent ground for refusal, separate from Article 3 - establishing that fair-trial concerns, detention conditions, and due process failures in the requesting state can each individually ground a refusal or deletion; and second, it introduces detailed sub-chapters on offence categories carrying elevated political-misuse risk, including former officials, freedom of expression, state security, terrorism and criminal group membership, and military-linked charges, with specific guidance on what the NDTF will examine in each category.

4. PRINCIPAL GROUNDS FOR REJECTION

A. Political Character under Article 3: The Predominance Test

Article 3 bars INTERPOL from undertaking activities of "a political, military, religious or racial character." The NDTF and CCF apply the predominance test: all relevant information is examined to determine whether the offence is of a predominantly political character. CCF Decision 2017-02[7] states the framework precisely, holding that the Commission "evaluates all relevant information and pertinent elements, as provided by the rules, to determine whether the offense is of a predominantly political character." CCF Decision 2017-14[8] elaborates on the

5. INTERPOL Compliance and Review — Notices; NDTF Compliance and Review Factsheet (7 June 2023)
7. CCF Decision Excerpt No. 02 (2017): Political character; Lack of action for extradition
8. CCF Decision Excerpt No. 14 (2017): Political character; Lawfulness/Validity; Lack of action for extradition

three key factors from Article 34(3) RPD: "the nature of the offence - namely the charges and underlying facts; the status of the persons concerned; and the general context of the case."

The test distinguishes pure political offences (acts criminalised solely for political reasons) from relative offences (ordinary-law acts whose prosecution is predominantly politically motivated). In Decision 2017-14, the Commission found a political context because "many of the former clients of the Bank have now come to power," while cautioning that "the mere assertion of an Applicant without any additional elements to support his contention would require the Commission to evaluate the reliability of a statement in a manner that should be undertaken at trial or during an extradition hearing" - making clear that unsupported political character claims are not accepted.

The general context element under Article 34(3)(g) RPD is the factor most often underestimated by requesting NCBs. The Repository of Practice (RoP) at paragraph 32(e) states that contextual information "may be considered for the purpose of understanding the context of the request or identifying aspects to further scrutinise," and goes further: "it might be relevant to assess a Red Notice request together with similar requests concerning other individuals wanted by the same country, or to consider the fact that those similar requests have been denied in the past." For charges carrying elevated political-misuse risk, the Repository is direct. On state-security offences, paragraph 3.4 of the RoP instructs the NDTF to examine "whether the conduct described in the summary of facts constitutes a recognisable ordinary-law crime in a broad cross-section of member states." On former public officials, paragraph 3.1[14] states that "the filing of charges against former politicians or civil servants shortly after a change of government may, in combination with other elements, be indicative of a politically motivated prosecution."

B. Lack of Action for Extradition

Article 81(3)(d) RPD requires cancellation of a notice when the requesting NCB, having been consulted after the subject is located, has neither taken steps to secure extradition nor provided reasonable grounds for the absence of such steps. In Decision 2017-02 the Commission found that "no formal extradition request was submitted" and deleted the notice. In Decision 2017-14 the Commission similarly held that the requesting NCB had not demonstrated appropriate steps toward extradition. CCF Decision 2018-16[11] recognised a constitutional prohibition on extraditing nationals as a reasonable ground for inaction, but a mere expectation of future extradition proceedings unsupported by any diplomatic or judicial steps does not suffice. The operational lesson is that a Red Notice must be requested as part of an existing extradition strategy.

C. Insufficient Judicial Data and the Summary of Facts

The failure to satisfy Article 83(2)(b)'s judicial data requirements, particularly the summary of facts, is the most operationally prevalent ground for both NDTF refusal and deletion by the CCF. Article 83(2)(b)(i) requires "a summary of facts of the case, which shall provide a

14. Repository of Practice (3rd edn, 2024), paras. 3.1 and 3.4.

11. CCF Decision Excerpt No. 16 (2018): Purpose of data; Lawfulness/Validity

succinct and clear description of the criminal activities of the wanted person, including the time and location of the alleged criminal activity." It is not a summary of the investigation, not a recitation of charges, and not a reproduction of statutory provisions.

The CCF's decisions establish the standard without ambiguity. Decision 2025-02[9] holds that "the publication of the present Notice requires the provision of facts that link the wanted individual to the charges against him, and a clear description of the criminal activities of which he is accused." Decision 2024-02[10] addressing a tax-fraud notice, deleted the request because "the information available cannot be considered as sufficient to demonstrate any criminal act, criminal intent, or personal benefit accruing to the individual." These two decisions together define a three-element checklist for every financial crime summary: specific criminal acts attributed to the individual; evidence of criminal intent; and evidence of personal benefit. A summary that addresses each element in concrete factual terms will survive scrutiny; one that reproduces statutory definitions or describes a collective scheme without individualising the wanted person's role will not.

Decision 2017-14 added the arrest warrant dimension: the notice was deleted because "the initial decision issued in this case is not an arrest warrant in the sense of RPD Article 83.2(b)(ii)", the document provided lacked the character of a judicial arrest authorisation. The warrant must be a subsisting judicial document, issued for the specific charges in the notice, by a court with jurisdiction.

Practitioner experience within the NDTF reveals consistent patterns: summaries that reproduce domestic charge-sheet language without narrative; financial crime requests that state amounts without identifying transactions; terrorism and organised crime requests that assert group membership without demonstrating active individual contribution. The RoP at paragraph 3.6[13] is explicit: "mere membership of a terrorist or criminal organisation, without evidence of specific criminal acts or a meaningful and active individual contribution to the organisation's criminal activities, is insufficient to satisfy the requirements of Article 83." The NDTF will query on this basis; the CCF will delete if the lacuna is not cured.

D. Special Requirements for PMLA-Based Requests

Money laundering under the Prevention of Money Laundering Act 2002 is a derivative offence: it is constituted by the processing of proceeds of a "scheduled offence" listed in the PMLA Schedule. The predicate offence is therefore legally constitutive of the PMLA charge, and this structure has a direct consequence for the summary of facts in any PMLA-based Red Notice request: the summary must address both the predicate offence and the laundering conduct as distinct but connected components.

The predicate offence section must describe, with the specificity required by Article 83(2)(b)(i), the specific criminal conduct that generated the proceeds — the fraud, the corruption, the customs violation with dates, locations, amounts, and the individual role of the wanted

9. CCF Decision Excerpt No. 02 (2025): Due process; Lawfulness or validity; Description of criminal activities

10. CCF Decision Excerpt No. 02 (2024): Description of criminal activities; Political character

13. Repository of Practice (3rd edn, 2024), para. 3.6.

person. The laundering section must then describe the specific acts by which the wanted person processed, moved, or integrated those proceeds: the accounts and jurisdictions used, the layering mechanisms employed, and the individual's role in each transaction. A summary that describes only the laundering transactions, without explaining the predicate, leaves the NDTF and any examining foreign magistrate unable to assess the criminality of the underlying conduct. Most jurisdictions apply a dual-criminality test in extradition proceedings, and the predicate offence must be recognisable as a crime in the executing state. If the summary does not explain it, that assessment cannot be made.

Where the predicate offence is investigated by one agency (such as CBI) and the PMLA case is investigated by another (such as ED), both proceedings must be cross-referenced, and the summaries of facts must be consistent. Inconsistencies between the predicate-offence narrative and the PMLA narrative are detected by the NDTF and raise doubts about the integrity of the entire request.

E. Family, Private, and Administrative Matters

CCF Decisions 2017-04 and 2017-08[12] applied the private-matter exclusion to commercial disputes clothed in criminal language. Decision 2025-01 applied the family-matter exclusion. On unfunded cheques, Decision 2018-03 held that "such acts would probably not be recognised as an extraditable offence in many other national systems, where the lack of dual criminality would prevent national authorities from acting," and that "the publication of Red Notices for the charges of uttering unfunded cheques may not, in most instances, lead in practice to actual international police cooperation." The notice was deleted. The analytical test is whether the conduct is criminal in substance involving dishonest intent, personal gain, and direct causation of harm recognisable across legal systems; not merely in form.

F. Human Rights Concerns under Article 2(1)

The RoP's systematic treatment of Article 2(1) as an independent compliance ground is the most significant recent development in Red Notice jurisprudence. At paragraph 33, the Repository[15] sets out four scenarios ranging from a violation that taints the entire case - refugee status engaging the non-refoulement principle, for instance, to violations remediable by data correction. Paragraph 19 confirms that internationally recognised human rights conventions binding in customary international law constrain the processing of data through INTERPOL channels. The doctrinal foundation in international jurisprudence is Soering v. United Kingdom[6], where the European Court of Human Rights held that surrendering a person to face "a real risk of being subjected to torture or to inhuman or degrading treatment" engages the surrendering state's responsibility. The CCF applies an analogous principle: maintaining a Red Notice that would facilitate surrender to such a situation is incompatible with Article 2(1). We, therefore, should prepare, in advance of any anticipated CCF complaint in high-profile cases, a written record addressing detention conditions, trial regularity, and the independence of the judicial proceedings, together with any assurances India is in a position to offer.

12. CCF Decision Excerpts Nos. 04 and 08 (2017): Private matter; No. 01 (2025): Family matter; No. 03 (2018): Unfunded cheques.

15. Repository of Practice (3rd edn, 2024), para. 33.

6. Soering v. United Kingdom, App. No. 14038/88, ECtHR, 7 July 1989, (1989) 11 EHRR 439, para. 87.

5. INDIA-SPECIFIC CHALLENGES AND THE DRAFTING GUIDE

A. The NCB Landscape: CBI, BharatPol, and the Coordination Gap

India's National Central Bureau is the Central Bureau of Investigation, designated under Article 32 of the Constitution. The CBI's IPCU processes all Red Notice requests from Indian agencies; the BharatPol portal, launched in January 2025, digitises submissions across five structured modules. BharatPol's structured data fields align more closely with RPD requirements than earlier unstructured formats, and a well-completed submission reduces NDTF query cycles.

The structural challenge, however, is not the portal but the coordination gap between the investigating agency, the prosecuting agency, the judicial authority issuing the arrest warrant, and the Ministry of External Affairs managing extradition diplomacy. A Red Notice request is generated by multiple agencies: ED, CBI, NIA, State Police; each presenting material in its accustomed domestic format, without awareness that the same narrative will be assessed by a multidisciplinary legal team in Lyon against international standards with no domestic analogue. Closing this gap requires that investigating officers and prosecutors understand INTERPOL's legal requirements from the inception of an investigation, so that the FIR, the charge sheet, and the arrest warrant are constructed in a manner that will support a compliant Red Notice request when the subject leaves the jurisdiction.

B. The FEOA 2018 and the INTERPOL Interface

The Fugitive Economic Offenders Act 2018 defines a fugitive economic offender as a person against whom a warrant has been issued for a scheduled offence, above the one-hundred-crore-rupee threshold and who has left India to avoid prosecution or refuses to return. FEOA designation and Red Notice publication are complementary but independent: FEOA designation does not circulate internationally or generate provisional arrest authority in member states. The value of FEOA proceedings for INTERPOL purposes lies in the judicial record they generate: the Special Court's findings identifying the nature and extent of the offence, the assets derived from it, and the nexus between the offence and the fugitive, would provide precisely the individualised, judicially validated factual material that Article 83(2)(b)(i) requires. The optimal way is to proceed with both in parallel, ensuring that the Red Notice summary of facts is consistent with and draws upon the FEOA court records. Where the predicate offence for PMLA charges has been examined in FEOA proceedings, those findings should be referenced in the PMLA summary and, where available, the relevant court orders provided under Article 85 RPD.

C. Operational Drafting Guide

The following paragraph synthesises the RPD, CCF jurisprudence, the 2024 Repository of Practice, and NDTF practice into a structured checklist for Red Notice request submissions.

i) Pre-submission assessment. Three threshold questions must be answered before drafting.

   a) Does the offence clear the exclusion-list bar? Domestic offences that are private commercial disputes, family matters, NI Act Section 138 charges without serious-crime linkage, or administrative violations should not be submitted as global Red Notices; targeted diffusions to specific NCBs are more appropriate.

b) Does each charge satisfy the penalty threshold, verified individually from the statute? Where the person is sought for prosecution, the conduct constituting the offence must be punishable by a maximum deprivation of liberty of at least two years, or a more serious penalty. Where the person is sought to serve a sentence already imposed, he or she must be sentenced to at least six months of imprisonment and/or there must be at least six months of the sentence remaining to be served.

c) Is the request genuinely of international interest, or is the subject known to be in a single country with which India has an active extradition treaty? In the latter case, a diffusion will achieve the same result with less risk of CCF challenge.

Extradition readiness must also exist before submission: MEA must have been consulted, the applicable treaty identified, and the outline of a formal extradition request prepared. A notice submitted without extradition preparedness creates the conditions for Article 81(3)(d) cancellation when the subject is located.

ii) Drafting the summary of facts. The summary must answer six questions in plain, precise language accessible to a legal officer in any member state without knowledge of Indian law:

a. Who are the wanted persons and what are their specific roles?

b. What specific acts did they commit?

c. On what dates and in what locations?

d. By what mechanism - what was the modus operandi, what instruments or systems were used?

e. What was the result - what was obtained and what harm was caused?

f. What is the evidence of personal benefit to the individuals?

A clear Red Notice request need not reproduce the entire charge-sheet. It should answer the essential questions in three to five focused paragraphs, in simple language, so that the concerned authorities can quickly understand what happened, what the accused did, what evidence supports it, and why urgent action is required. In fraud cases, the summary must specifically identify the dishonest representations, the inducement, and wherever applicable, the individual's personal gain or gain on behalf of the individual. In PMLA cases, the predicate-offence facts must appear as a distinct and mandatory component before the laundering narrative, with both sections internally consistent and cross-referenced to each other's court proceedings. In terrorism and organised crime cases, specific acts demonstrating active individual contribution must be described – mere group membership asserted without more details will not satisfy Article 83.

iii) Managing arrest warrants and charges. The warrant must be identified by court, date, number, and the specific charges it covers. Where multiple warrants exist, only the one corresponding to the notice charges should be cited. The maximum statutory penalty must be stated per charge; where some charges clear the two-year threshold and others do not, Article 83(1)(c) permits the notice to cover only the compliant charges. Charges framed under Indian statutes with no obvious foreign equivalent like specific PMLA

provisions, FCRA, Companies Act sections, should be accompanied by a brief plain-language description of the conduct criminalised, assisting both NDTF review and the executing state's dual-criminality analysis.

iv) Article 2(1) readiness. In cases where the wanted person holds refugee or asylum status abroad, or where custodial or fair-trial concerns are anticipated, the requesting NCB should prepare in advance a written record addressing detention conditions, trial regularity, and the independence of the relevant judicial proceedings, together with specific, verifiable assurances India is in a position to offer.

CONCLUSION

A Red Notice that does not survive NDTF review never circulates. The notice deleted by the CCF leaves the requesting state without the instrument and, in some cases, with a public finding of non-compliance. The refusals in 2025 are an invitation to raise the standard of requesting-state practice, not evidence that the system is closed to legitimate law enforcement.

India's achievement of 112 Red Notices in a single year, the launch of BharatPol, and the sustained focus on fugitives are genuine advances. The CBI, being the NCB of India has consolidated them by ensuring a quality review function that examines every request against the RPD checklist and relevant INTERPOL guidelines before transmission to INTERPOL. CBI has also been working on sharing of best practices with Interpol Liaison Officers of State Police. The need of the hour is to consider adopting a standard summary-of-facts framework requiring individualised attribution of specific criminal conduct, with dates, locations, mechanisms and personal benefit identified for each wanted person; for PMLA cases, the predicate-offence narrative must be a mandatory standalone component.

This also underlines the need for structured and continuous capacity-building. Preparation of a Red Notice should not be treated as a mechanical process of sending case papers, but as a specialised exercise requiring in-depth understanding of INTERPOL's legal standards, extradition requirements, human-rights concerns and the manner in which facts are assessed in other jurisdictions. Investigating officers, prosecutors, supervisory officers and INTERPOL Liaison Officers would benefit from regular training modules, model summaries of facts, standard checklists, and practical case studies of requests that were queried, refused or deleted. Such training may focus especially on how to present the individualised role of the wanted person, the evidence linking him to the offence, the validity of the warrant, the purpose of extradition, and the safeguards available in the Indian criminal justice system. If this discipline is built at the originating-agency level itself, the NCB will receive better-prepared proposals, avoid unnecessary query cycles, and will improve the chances that India's Red Notice requests not only survive scrutiny but also lead to effective location, arrest and return of fugitives.

The measure of a mature NCB is not the number of Red Notices it submits but the proportion that survive scrutiny, lead to arrest, and ultimately support the return of fugitives to face justice. Quality is the benchmark, and quality begins with the drafting officer's understanding of what INTERPOL's legal framework requires.

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INNOVATIONS IN POLICING

1. UTTAR PRADESH POLICE: 'PABANDI' PORTAL STRENGTHENS PREVENTIVE AND PROACTIVE POLICING



Uttar Pradesh Police has introduced the 'Pabandi' portal to strengthen preventive policing and enable timely intervention in cases requiring preventive action under the Bharatiya Nagarik Suraksha Sanhita (BNSS). The digital platform records and manages preventive cases through an AI-assisted risk assessment system that categorises incidents as high, medium, or low risk once General Diary entries are uploaded. This enables police units to closely monitor habitual offenders, sensitive disputes, and emerging threats in real time. The portal also generates automated alerts to ensure timely supervisory review and prompt action by field officers. By reducing dependence on manual documentation and streamlining monitoring processes, the system improves operational efficiency and accountability. The initiative reflects a shift from reactive policing toward a more data-driven and proactive law enforcement framework.

2. HARYANA POLICE INTEGRATES ARTIFICIAL INTELLIGENCE INTO EMERGENCY RESPONSE SYSTEM



Haryana Police has initiated the next phase of the "Haryana 112" project by integrating artificial intelligence into the Unified Emergency Response System to improve emergency response efficiency and reduce response times. The integrated platform combines police, fire, and ambulance services while using predictive analytics for improved allocation of resources. The initiative aims to significantly reduce average response time and enhance coordination among emergency services. In addition, the Madhuban Forensic Science Laboratory has introduced India's first barcode-based evidence tracking system. These measures collectively strengthen Haryana's emergency response and forensic management.

3. GUJARAT POLICE INTRODUCES AADHAAR-INTEGRATED 'PATHIK' SOFTWARE FOR INSTANT VERIFICATION



The Ahmedabad Crime Branch has become the first law enforcement agency in India to be recognised by UIDAI as an Offline Verification Seeking Entity (OVSE), enabling integration of its 'Pathik' software with Aadhaar-based offline verification systems. The platform facilitates instant and paperless verification of hotel guests, homestay occupants, and paying guests through scanning of Aadhaar QR codes without storing Aadhaar numbers, thereby ensuring data privacy and security. The system is currently linked with more than 9,000 hotels and has reportedly assisted in tracing several missing persons.

4. AI-POWERED RAIL ROBOCOP ASSISTS RAILWAY PROTECTION FORCE IN APPREHENDING HABITUAL OFFENDERS



The Railway Protection Force (RPF) has deployed an AI-powered humanoid "Rail Robocop" at Visakhapatnam Railway Station to strengthen surveillance, passenger safety, and crime prevention measures. Within days of deployment, the system successfully assisted in identifying and apprehending two habitual offenders by matching facial images with a preloaded criminal database and generating real-time alerts to the RPF control room. The intervention enabled rapid verification and coordinated field action by railway security personnel. Developed using indigenous technology, the robocop is equipped to support surveillance, crowd management, passenger assistance, and security awareness activities. The successful deployment demonstrates the operational utility of AI-enabled facial recognition and automated surveillance systems in enhancing railway security and preventive policing.

5. ANDHRA PRADESH POLICE LAUNCH 'AI4AP POLICE' PILOT PROJECT



Andhra Pradesh Police has launched the 'AI4AP Police' project to adopt data-driven and evidence-based policing through the integration of artificial intelligence into policing functions. The pilot project is being implemented in Annamaiah, Chittoor, and Guntur districts. The initiative integrates eight AI-powered modules for challenges ranging from grievance redressal to

data analysis into a unified ecosystem. Key modules include Petition AI, Digital Evidence AI, CognitiveNet AI, and an Investigation Co-Pilot to assist officers in legal procedures and case documentation. The project reflects the increasing use of AI-enabled technologies in policing.

6. AI VISION PLATFORM ENHANCES FACIAL RECOGNITION AND PREDICTIVE POLICING CAPABILITIES



The AI Vision platform developed by Innefu has been deployed across police forces and safe city projects in India to strengthen facial recognition, surveillance, and predictive policing capabilities. The platform reportedly achieves 99.7% facial recognition accuracy and can process feeds from hundreds of cameras simultaneously while integrating with body-worn cameras for field deployment. The system has assisted in identifying missing children and detecting suspects from low-quality or partially obscured CCTV footage that could not be effectively analysed through manual review. In addition, AI-enabled predictive policing systems have demonstrated the ability to forecast crime patterns with 75% accuracy in specific regions, enabling pre-emptive action. The platform also incorporates generative AI-based interfaces that enable officers to interact with large datasets through natural language inputs, thereby aiding in documentation, reporting, and data analysis processes.

The Indian Police Journal
Volume 73, Number 1 | ISSN 0537-2429 | January-June, 2026

Note for Contributors

The Indian Police Journal (IPJ) is the oldest Police Journal of the country, being published since 1954. A flagship Journal of the Bureau of Police Research and Development (BPR&D), MHA, it is published on a half yearly basis.

The IPJ is peer reviewed and features various matters and subjects relating to policing, internal security, police reforms, good practices and allied subjects. Over the years it has evolved as an academic journal of the Indian Police, providing critical inputs to stakeholders. It is circulated through hard copy and is also available on the BPR&D website https://bprd.nic.in/

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Interested author/s may note that the following criteria are mandatory for papers/articles–

- Total length with keywords and abstract should be between 3,000-5,000 words.
- The topic should be related to police and security subjects, as outlined above.
- The paper/article should be original and should not have been published anywhere else previously.
- A brief about the author/s and passport photo/s of the author/s should also be submitted.
- The paper/article can be submitted via email to: dig-spd1@bprd.nic.in

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