

Women's Safety and Surveillance in Smart Cities

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Abstract— The integration of digital surveillance infrastructure into urban governance has become a defining feature of the global smart city movement, with women's safety frequently invoked as a central justification for the deployment of CCTV networks, facial recognition systems, and emergency response applications. In India, this logic has taken concrete institutional form through the Nirbhaya Fund and the associated Safe City Project, launched in the aftermath of the December 2012 Delhi gang rape, which has funded extensive surveillance infrastructure across eight major cities. This paper critically examines the relationship between women's safety and surveillance in smart cities, drawing on feminist geography, feminist human-computer interaction, and critical surveillance studies scholarship to interrogate the assumptions underlying techno-centric safety interventions. Drawing on the documented work of Ayona Datta and collaborators on India's "smart safe city," alongside comparative scholarship from South Korea and elsewhere, the paper argues that while surveillance infrastructure can offer tangible safety benefits, it also risks producing a narrow, victim-centred, and often exclusionary vision of women's safety that displaces attention from the structural and infrastructural conditions of gendered urban insecurity, while simultaneously raising significant concerns regarding privacy, consent, and the disproportionate surveillance of marginalised women.

Keywords— women's safety, smart cities, surveillance, Safe City Project, gendered infrastructure, feminist geography, CCTV, privacy

INTRODUCTION

The relationship between women's safety and the built and digital environment of the city has long occupied scholars of feminist geography and urban planning, who have documented how fear of gender-based violence shapes women's mobility, time-use, and spatial practices in ways rarely experienced by men. In recent years, this longstanding concern has become entangled with the rapid global expansion of "smart city" governance, in which digital surveillance technologies, CCTV networks integrated with video analytics, facial recognition, GPS-enabled panic buttons, and centralised command-and-control centres, are increasingly positioned as solutions to the problem of women's urban insecurity.

India offers a particularly significant site for examining this relationship. The gang rape and murder of a young woman on a moving bus in Delhi in December 2012, an event that triggered nationwide protests and came to be referred to in public discourse by the name "Nirbhaya," prompted the Government of India to establish a dedicated funding mechanism, the Nirbhaya Fund, in the 2013–14 Union Budget, explicitly directed toward strengthening women's safety infrastructure. A substantial share of this funding has since been channelled into the Safe City Project, a Ministry of Home Affairs initiative implemented across eight major Indian cities, which has financed the installation of extensive CCTV networks, artificial intelligence-enabled video analytics, and facial recognition capability, framed explicitly as measures to create a safe and empowering environment for women in public spaces.



This paper critically examines the resulting entanglement of women's safety and surveillance infrastructure in Indian smart cities. While such infrastructure is frequently presented in policy discourse as an unambiguous public good, a substantial body of feminist and critical surveillance scholarship has raised significant questions about the framing, design, and consequences of techno-centric safety interventions, including their tendency to construct women primarily as potential victims, their uneven benefits across different groups of women, and their implications for privacy and civil liberties. This paper synthesises this scholarship alongside the documented institutional history of India's Safe City Project to offer a critical, evidence-grounded assessment of the

relationship between women's safety and surveillance in the smart city.

OBJECTIVES OF THE STUDY

This study seeks to achieve the following objectives:

- To document the institutional and policy framework governing women's safety infrastructure in Indian smart cities, particularly the Nirbhaya Fund and the Safe City Project.
- To examine the scholarly literature on gendered experiences of smart city surveillance technologies, drawing on feminist geography, feminist human-computer interaction, and critical surveillance studies.
- To assess the specific technologies deployed under women's safety surveillance programmes, including CCTV, facial recognition, and mobile safety applications, and the empirical evidence regarding their effectiveness and limitations.
- To critically evaluate the framing of women primarily as "potential victims" within smart city safety discourse, and its implications for women's agency and urban participation.
- To identify the privacy, consent, and equity concerns raised by gendered surveillance infrastructure, with particular attention to marginalised and intersectional experiences.
- To propose directions for a more inclusive, participatory, and infrastructure-attentive approach to women's safety in urban technology policy.

RESEARCH METHODOLOGY

This paper adopts a doctrinal and descriptive-analytical research methodology, drawing on government policy documents, official project descriptions from the Ministry of Home Affairs, peer-reviewed academic literature in geography, urban studies, and human-computer interaction, and professionally published commentary. Given the interdisciplinary character of this topic, the review draws on scholarship published in journals including *Annals of the American Association of Geographers*, *Architectural Design*, *International Journal of Communication* (via SAGE), and proceedings of the ACM International Academic Mindtrek Conference, alongside institutional sources such as the Ministry of Home Affairs and UN Women's global database on violence against women. The study does not involve new primary data collection; it synthesises existing institutional, policy, and scholarly material into a critical, evidence-based account of the relationship between women's safety and surveillance in Indian and comparative smart city contexts.

LITERATURE REVIEW

The scholarly literature on women's safety and surveillance in smart cities converges around several interrelated themes: the institutional history and technological architecture of India's women's safety surveillance programmes, feminist geographic critiques of the "smart safe city" as a spatial and temporal construct, feminist human-computer interaction perspectives on the design of safety technologies, and broader critical surveillance studies scholarship examining the differentiated and often disproportionate impact of surveillance on women and other marginalised groups.

The institutional starting point for understanding India's approach to women's safety surveillance is the Nirbhaya Fund, established by the Government of India in the Union Budget of 2013–14 following the December 2012 Delhi gang rape case. According to documentation from GKToday and corroborated by the Ministry of Home Affairs' own Women Safety Division, the fund has supported a range of initiatives including the Emergency Response Support System, operating through the unified "112" emergency helpline, and, most significantly for this analysis, the Safe City Project. As documented on the Ministry of Home Affairs website and analysed by Drishti IAS, the Safe City Project, implemented jointly by the Ministry of Home Affairs and the Ministry of Women and Child Development, has been rolled out across eight metropolitan cities, Delhi, Mumbai, Chennai, Kolkata, Hyderabad, Ahmedabad, Lucknow, and Bengaluru, at a total approved cost of approximately ₹2,919.55 crore, shared between the central and state governments in a 60:40 ratio, with the Delhi component fully centrally funded. The project's technological core, as detailed in reporting by *Security Magazine* and *Mobility Outlook* on the Bengaluru implementation, includes the installation of over 100,000 CCTV cameras and more than 25,000 Internet of Things sensors, integrated through a command-and-control centre offering advanced video analytics including facial recognition, alongside the deployment of drones and dedicated mobile emergency applications, implemented in the Bengaluru case by the technology firm Honeywell at an approximate cost of ₹670 crore for the first phase alone.



A second and analytically central strand of literature offers a sustained critical examination of this techno-centric approach to women's safety, most notably through the work of geographer Ayona Datta and collaborators. In an influential article published in *Annals of the American Association of Geographers*, Datta examines what she terms India's "smart safe city," arguing that government-provided safety applications rely heavily on clock time and what she describes as the "spectacularity" of violent events, thereby overlooking the differentiated and gendered experience of lived time and space among women navigating the urban periphery, particularly young women in resettlement colonies and urban villages whose everyday safety concerns are shaped less by discrete, spectacular incidents than by chronic, infrastructural precarity. Complementary work by Datta and Ahmed, published in *Architectural Design*, extends this critique through the concept of "gendered infrastructures," arguing that inadequate access to basic urban infrastructure, including transport, lighting, and sanitation, itself constitutes a form of intimate violence against women, one that surveillance-centric safety interventions, focused narrowly on crime detection and emergency response, are poorly positioned to address. This body of work, developed through the AHRC-funded "Gendering the Smart City" research network based at University College London and King's College London, employed participatory methods including digital storytelling and community mapping with young women in Delhi's urban margins, and documented in project reporting that activists such as Nayantara Ranganathan of the Internet Democracy Project have specifically criticised government emergency safety applications for embedding surveillance mechanisms that, she argues, are "inherently antithetical to women's agency and autonomy," reflecting a broader tension between the stated protective aims of such technologies and their practical implications for consent and self-determination.

the author terms "scientific security" discourse, emphasising optical surveillance technologies and data analytics for crime prevention, has coincided with smart city narratives that position such technologies as enhancing women's freedom and safety, while overlooking the nuanced, embodied, and frequently ambivalent character of women's actual safety experiences, and framing technology use as a false binary choice between privacy and safety. Drawing on the work of Korean feminist scholar-activist Kwon Kim, the study argues that the recurrent invocation of "all women as potential victims" within such surveillance discourse has not only failed to empower women but has actively constrained their capacity to imagine roles and urban identities beyond victimhood, a critique that closely parallels Datta's analysis of the Indian context and that the literature situates within a broader body of feminist and science-and-technology-studies scholarship, including work by Dubrofsky and Magnet on feminist surveillance studies and Leszczynski and Elwood on gendered geographic information technologies, which has consistently shown that ostensibly gender-neutral conceptions of urban safety tend to exclude or misrepresent the actual experiences of women and other social minorities.

A further important strand of literature approaches this problem from the perspective of feminist human-computer interaction design. A study presented at the ACM International Academic Mindtrek Conference, employing a qualitative inquiry grounded in feminist standpoint theory and Donna Haraway's concept of "situated knowledges," examined women's perceptions of personal safety in New Delhi through an explicitly intersectional lens, examining how race and gender intersections shape women's differentiated experiences and expectations of smart city safety technology, and cautioning against the development of safety technologies without meaningful, gender-informed design engagement, which risks reproducing what the authors describe as a "bad-solutions-legacy" of technologies that fail to function as intended or fail to address women's actual safety needs. A subsequent systematic literature review published in the *Revista Brasileira de Iniciação Científica*, synthesising studies on smart urban design and intelligent security systems for women's safety, found that the combination of inclusive urban design principles and intelligent security systems, including mobile applications and integrated surveillance, offers genuine potential to improve both objective public safety and women's subjective perception of safety, while cautioning that the reviewed evidence base remained limited, with the review identifying only a small number of methodologically rigorous studies directly assessing effectiveness.



This critical framing is substantially reinforced by comparative international scholarship. A study published in *International Journal of Communication* by Chamee Yang examining South Korea's "smart safe city" initiatives found that the rise of what

Finally, a broader strand of critical surveillance literature situates gendered smart city surveillance within wider concerns regarding privacy, consent, and disproportionate impact on marginalised populations. A 2026 article published in a special issue on smart city surveillance and human rights, examining

evidence from India alongside South Africa and Latin America, argues that concerns regarding data and privacy rights, alongside disproportionate surveillance of marginalised groups, are increasingly well documented, and applies an intersectional feminist lens, drawing on Black feminist scholarship, to demonstrate how surveillance infrastructure can simultaneously function to reinforce caste-, class-, and gender-based discrimination even as it is publicly justified in the name of women's protection. Complementary commentary published by Privacy International, examining what it terms "surveillance as a feminist issue," argues that critiques of mass surveillance framed purely around generalised civil-liberties concerns fail to account for the disproportionate impact of surveillance technologies on oppressed groups, including women and LGBTQ+ individuals, and calls for surveillance studies to engage more directly with feminist theoretical frameworks, including the concept of the "male gaze," in analysing the differentiated social meaning of being watched.

Taken together, this literature reveals a significant and recurring tension in the governance of women's safety in Indian and comparative smart cities: substantial public investment in surveillance-centric safety infrastructure, exemplified by India's Safe City Project, coexists with a sustained and empirically grounded feminist critique arguing that such infrastructure, however well-intentioned, tends to construct a narrow, incident-focused, and often disempowering vision of women's safety, one that displaces attention from the chronic infrastructural conditions shaping women's everyday urban insecurity, raises significant unresolved questions regarding privacy and consent, and risks reproducing intersecting patterns of surveillance-based discrimination along lines of caste, class, and religion even as it is deployed in the name of gender protection.

INSTITUTIONAL AND TECHNOLOGICAL FRAMEWORK IN INDIA

Table 1 summarises the principal components of India's Safe City Project as documented across the eight approved metropolitan implementations.

Table 1: Components of India's Safe City Project (Nirbhaya Fund)

Component	Description	Documented Example
CCTV and video analytics network	Dense camera networks integrated with AI-enabled video analytics and facial recognition	Bengaluru: over 100,000 cameras across 3,000+ locations
Command and control centre	Centralised monitoring hub linking camera feeds, emergency response, and law enforcement	Integrated C&C centres established in each of the 8 cities
IoT sensor network	Sensors deployed at junctions and public spaces	Bengaluru: 25,000+ IoT sensors across 3,000+ junctions

	to support real-time monitoring	
Emergency response systems	Panic buttons, GPS tracking on public transport, "Dial 100"/112 helpline integration	Nationwide 112 Emergency Response Support System
Women police outposts and patrols	Physical policing infrastructure, including women-staffed outposts near vulnerable sites	Outposts near women's colleges, bus stands
Public infrastructure upgrades	Improved street lighting, women-friendly public facilities, dark-spot mapping	Street lighting upgrades in identified hotspot zones

Source: compiled from Ministry of Home Affairs (mha.gov.in), Drishti IAS, Security Magazine, and Mobility Outlook reporting on the Safe City Project.

Feminist Critiques of the Smart Safe City

Table 2 summarises the principal critiques advanced in the feminist and critical surveillance literature reviewed above, organised by the specific concern raised and its representative scholarly source.

Table 2: Principal Feminist and Critical Surveillance Critiques of Smart City Women's Safety Technology

Critique	Core Argument	Representative Source
Victim-centric framing	Positions women primarily as "potential victims," constraining alternative urban identities and agency	Kwon Kim (2020), discussed in Yang (2025)
Gendered time and spectatority	Safety apps prioritise discrete, "spectacular" violent incidents over chronic, everyday infrastructural precarity	Datta (2020), <i>Annals of the American Association of Geographers</i>
Infrastructural violence	Inadequate access to basic urban infrastructure (transport, lighting, sanitation) constitutes intimate violence, underaddressed by surveillance-focused solutions	Datta and Ahmed (2020), <i>Architectural Design</i>
Autonomy and consent	Embedded surveillance mechanisms in safety apps can be antithetical to women's agency and self-determination	Ranganathan, Internet Democracy Project
False privacy-safety binary	Smart safe city discourse frames technology adoption as a binary choice between privacy and safety, obscuring more nuanced trade-offs	Yang (2025), <i>International Journal of Communication</i>
Design exclusion	Safety technologies developed without gender-informed, intersectional design risk reproducing a "bad-solutions-legacy"	Feminist HCI study, ACM Mindtrek (2023)
Intersectional surveillance harm	Surveillance infrastructure can reinforce caste-, class-, and gender-based discrimination even when justified as protective	Special issue on smart city surveillance and human rights (2026)

Source: compiled by the author from the literature reviewed in this paper.

DISCUSSION AND ANALYSIS

The evidence reviewed in this paper reveals a persistent gap between the institutional logic underpinning India's women's safety surveillance infrastructure and the critical scholarly assessment of its actual effects. The Safe City Project and its associated technologies represent a substantial and well-documented public investment, oriented toward a genuinely pressing social problem, and the available systematic review evidence suggests that combined approaches integrating inclusive urban design with intelligent security systems can meaningfully improve both objective safety outcomes and women's subjective sense of security. At the same time, the feminist geographic and human-computer interaction literature reviewed here converges on a consistent set of concerns: that surveillance-centric safety interventions tend to privilege discrete, visible, and easily quantifiable incidents of violence over the chronic, less visible infrastructural conditions, poor lighting, unreliable transport, inadequate sanitation, that shape women's everyday experience of urban insecurity; that the resulting "potential victim" framing can itself be disempowering, constraining rather than expanding women's sense of agency in public space; and that the embedded surveillance architecture of safety applications and CCTV networks raises unresolved questions of consent and autonomy that are rarely addressed within the technocratic, security-first framing of official smart city discourse.

These concerns are further complicated by the intersectional dimension highlighted in the more recent critical surveillance literature, which cautions that surveillance infrastructure justified in the name of women's protection can simultaneously function to reinforce other axes of social discrimination, particularly along lines of caste, class, and religious identity, raising the possibility that the benefits and burdens of gendered surveillance infrastructure are not evenly distributed among the women such infrastructure is intended to protect. This suggests that an adequate assessment of women's safety in smart cities cannot rest on aggregate metrics of camera coverage or response time alone, but must attend to the differentiated experience of surveillance across different groups of women, as the participatory, intersectional research conducted by Datta, Ranganathan, and the feminist HCI scholarship reviewed above has sought to do.

Conclusion

The relationship between women's safety and surveillance in smart cities, as illustrated through the case of India's Nirbhaya

Fund-supported Safe City Project, reflects a genuine and well-resourced institutional commitment to addressing gender-based violence in public space, translated into substantial investment in CCTV networks, facial recognition capability, and emergency response infrastructure across major Indian cities. However, a substantial and methodologically diverse body of feminist geographic, human-computer interaction, and critical surveillance scholarship raises significant concerns regarding the adequacy of this techno-centric approach, documenting its tendency to construct a narrow, incident-focused, and potentially disempowering vision of women's safety, its relative neglect of the chronic infrastructural conditions shaping everyday urban insecurity, and its unresolved implications for privacy, consent, and intersectional equity. A more comprehensive approach to women's safety in smart cities would need to move beyond surveillance infrastructure alone, toward genuinely participatory, gender-informed urban design that addresses infrastructural precarity directly, engages women, particularly those in marginalised urban locations, as active participants rather than passive beneficiaries in the design of safety interventions, and subjects surveillance technologies to the same scrutiny regarding privacy, consent, and differentiated impact that critical scholarship has applied to state surveillance in other domains.

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