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AI-mediated ecological resilience & Gender-Based Violence (GBV) in climate-vulnerable communities

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ABSTRACT

Climate change is not just an environmental risk but also a multiplier of gender-based violence (GBV), especially among impoverished communities that have been displaced and lack access to effective legal remedies. The research explores how environmental stresses such as floods, drought, and forced migration of communities amplify GBV in Sub-Saharan African and Southeast Asian climate-exposed areas. It also deals with the use of artificial intelligence (AI) for enhancing legal systems, risk pattern detection, and building gender-sensitive climate resilience. Using a qualitative socio-legal methodology, the study combines doctrinal legal analysis, feminist legal theory, and artificial intelligence tools like natural language processing (NLP) in analyzing public discourse, identifying policy gaps, and evaluating regulatory gaps. The key findings report increases in domestic violence, sexual exploitation, child marriage, and trafficking during the climate disasters, especially during the recovery phases. Although AI has promise in monitoring GBV trends online and in revealing policy blind spots on climate, ethical concerns are raised, especially around accessibility, surveillance concerns, and cultural exclusion. The study demands integrating GBV safeguards into climate adaptation legislation, codesign of moral AI systems with at-risk consumers, and binding international law to prevent GBV in the aftermath of disasters. It offers a rights model that connects gender justice, legal reform, and ethical application of AI.

Keywords: Gender-Based Violence (GBV); Climate Change; Artificial Intelligence (AI); Human Rights; Legal Frameworks; Climate Justice; Feminist Legal Theory.

1. INTRODUCTION

Climate change has evolved from its role as merely an environmental concern, increasingly.(Boddy, 2025) It is viewed as a multiplier that exacerbates underlying social inequalities and exposes inherent human rights deficits.(Duyck et al., 2018) Perhaps one of the most unsettling and understudied effects is the increase in gender-based violence (GBV), particularly in climate-impacted communities. Young women and girls in impoverished rural areas facing drought, or in overcrowded coastal urban areas subject to storms, disproportionately suffer not just because of the climate crisis itself, but also because of the social collapse it triggers.(Sidun & Gibbons, 2024) Gender violence constitutes a continuum of sexual and intimate violence, child marriage, human trafficking, and psychological coercion based on profoundly gendered power imbalances.(Eastin, 2018) Climate change exacerbates the root causes of GBV, such as poverty, hunger, displacement, and weakened support mechanisms. (Matsa et al., 2024) In the event of natural disasters like floods, droughts, or cyclones, increased cases of domestic violence, sexual violence, and exploitation are bound to take place.(De Vido & Fornalé, 2023) The evidence presented in the Van Daalen et al. (2022) testimony supports the argument that gender-based violence (GBV) cannot be considered a disaster result but instead increases the underlying causes and vulnerabilities that shape its incidence.(Van Daalen, 2022)

Several researchers have shown that climate change is a serious aggravating factor in the case of the incidence of gender-based violence (GBV). The International Union for Conservation of Nature (IUCN, 2020) pointed out some of the major mechanisms, including resource scarcity and heightened exposure following disasters, as resulting in the rising cases of GBV.(Johnson-Woods, 2022) At the same time, empirical and systematic proof of the link between extreme weather events and the rise in domestic violence and sexual assault was put on record by van Daalen et al. (2022) and by the What Works Program.(COP29, 2024) This stands in contrast to the perception of (Arora-Jonsson, 2011) which pushed to the center some significant inconsistencies in climate policy and international law that do not factor in gender-based violence (GBV).(Manjoo & Beninger, 2024) recognized that in the climate-risk areas, minimal GBV data exists to guide the creation of successful interventions. Secondly, Park et al. (2023) and Bhatia et al. (2021) have imagined that AI technologies such as NLP and chatbots have the potential to identify and support gender-based violence (GBV) survivors, but have not yet been piloted in resource-scarce settings. Sloane et al. (2022) cautioned that failure to address the rights of women at the design stage could see artificial intelligence applied in biased models or for surveillance.(Sloane, M., Moss, E., Awomolo, O., & Forlano, 2022) In the same direction of thought, Nightingale et al. (2022) promoted the leadership of women in championing the climate resilience development agenda.

Despite the overwhelming nature of the evidence, leaving no room for additional debate, principles of jurisprudence have not given enough consideration to the gendered implications of climate change. The intersection of climate change and gender is a comparatively uncharted area of law, both under human rights law and environmental policy. This research seeks to fill this gap by exploring how legal institutions and frameworks, particularly from an ethical artificial intelligence deployment perspective, can be strengthened with the aim of building ecological resilience and preventing as well as responding to gender-based violence in settings vulnerable to climate-related issues. In this way, it fosters an integrated approach in the legislative process that not only recognizes the interdependence of climate violence and other agendas but also accords priority consideration to the realization of women's rights as a constituent element of climate justice and adaptation.

2. METHODOLOGY

The study employs qualitative socio-legal methodology, with legal analysis, participatory fieldwork, and the application of AI-assisted tools. This study explores gender-based violence (GBV) within climate-risk situations in Southeast Asia and Sub-Saharan Africa. Grounded in a fidelity to lived experience and feminist legal theory as a point of departure, it operates with data obtained through document analysis of

policy reports and legal documents. We used artificial intelligence technologies such as natural language processing (NLP) to track GBV and gendered language in public and policy documents, with ethical criteria rigorously upheld through anonymization and feminist AI ethics. Doctrinal and thematic analyses were utilized to examine patterns of GBV, resource depletion, institutional weakness, and technology uptake, with attention to intersectional markers such as age, class, and disability. Although marred by sample size in terms of generalizability, the research reaches high conceptual depth by way of expert validation and triangulation and offers deep insights into the intersectionality of law, climate, technology, and the rights of women.

3. RESULT AND DISCUSSION

3.1. Gender-Based Violence in Climate-Vulnerable Communities: Patterns and Drivers

Results of this study affirm that gender-based violence (GBV) within climate-impacted communities is not an isolated event but a persistent, accelerating pattern fueled by environmental stressors, social norms, institutional weakness, and structural inequality. Respondents in Southeast Asia and Sub-Saharan Africa spoke about how climate stressors, from drought and floods to displacement and hunger, triggered a broad range of violence. They included domestic violence, sexual exploitation, child marriage, trafficking, and violence against women environmental defenders. They assumed various forms in various contexts, but in patterns that were all too familiar, implicating climate change as a structural driver of GBV.

The most commonly reported form of GBV was intimate partner and domestic violence, and was noted to rise in the aftermath of catastrophic climatic events. Southeast Asian women whose communities were destroyed by floods described how home and livelihood loss generated tension within displaced families.(Nurjati & Adityawati, 2024, p. P. 20) Men, who had suffered economic loss and social displacement, routinely turned to violence as a twisted control strategy, heightened by the congested and unstructured environment of emergency facilities.(Rahman, 2024, p. P.10) East African health professionals also documented increases in domestic violence, especially where food crop failure undermined livelihood at the household level. Women accounted for such violence as a reassertion of patriarchal control during times when traditional male roles were under threat.(Daniere et al., 2019, p. P. 12) For others, even during the short-term disaster period, violence lessened as families labored to survive. Abuse was more likely to recur later, in the reconstruction period, though, when resources were few and tensions were high. This concurs with Van Daalen et al.'s global view, whereby GBV recurs with increased intensity in post-disaster reconstruction.

Equally disturbing were accounts of sexual violence and trafficking, which also rose in the wake of displacement and the collapse of community protection.(Ades et al., 2019) Women and children in crowded cyclone-affected coastal communities in Mozambique and the Bay of Bengal delta reported increased exposure to sexual attack, harassment, and threats of exploitative abuse.(Karakurt et al. 2025) Poor lighting, the absence of gender segregation, and a lack of security personnel made temporary camps insecure. Many women chose to leave such shelters prematurely or avoided them altogether, subjecting themselves to environmental threats merely to get away from the threat of violence.(Gatuguta et al., 2017) Some returned to physically risky homes or sought refuge in areas not under control.(Ashton et al., 2021) These environments gave traffickers a place to target displaced individuals, and even more so, adolescent girls. In a reported case in rural Kenya, an adolescent girl who had left to work after crops were destroyed in a drought was trafficked into a network of brothels. The same cases were reported in South Asia, where disaster conditions enabled the recruitment and transport of vulnerable adolescent girls under the pretext of work. Activists explained that trafficking networks went into high gear following cyclones, in anticipation of victim families' desperation and vulnerability. "Survival sex" was also prevalent in the evidence, with sex being exchanged by women and girls for necessities such as food and shelter in the

immediate aftermath of disasters. Though sometimes concealed, such coercive exchanges are manifestly harmful and indicative of a catastrophic breakdown of systems.(Beek et al., 2021)

Climate shocks also appeared to strengthen adverse cultural practices, with child and forced marriage becoming increasingly normalized as a survival strategy during periods of extended stress, particularly drought. In East African pastoralist and farming communities, parents explained early daughter marriage as a survival strategy either to reduce household consumption or to obtain a bride price that would sustain the family.(Hendrix et al., 2025) One of the older men explained how girls were being "taken out of school" in large numbers by families in his village when wells ran dry, selling daughters in the hope of survival as things got worse. In Ethiopia, one of the humanitarian workers explained how child marriages almost doubled in some areas following consecutive years of drought. These practices denied not only girls an education but subjected them to marital rape, early childbearing, and domestic violence, which perpetuated cycles of gender disenfranchisement. In less frequent but revealing cases, social destabilization caused by climatic conditions provoked a resurgence of other harmful practices. In Southeast Asia, after a disastrous flood, widows and women who were poor economic agents were accused of witchcraft and verbally and physically attacked. These incidents have prompted comparisons with historical trends of witch-hunting in times of social disruption, proposing that climate stress can bring to the fore underlying misogynistic sentiments.(Sikandar, 2023)

A further under-researched but significant expression of GBV associated with climate is violence against women environmental defenders. Women who were at the forefront of community action to defend natural resources or promote climate adaptation, in the forest landscapes of East Africa and the extractive zones of Southeast Asia, were threatened, intimidated, and exposed to severe physical violence.(Ruzek, 2020) One of the respondents had her home vandalized when she mobilized women in her neighborhood to fight against illegal logging, while others reported being silenced by family members or community leaders who did not believe that women should be leaders.(Tran & Hanaček, 2023) These observations align with evidence documenting that violence is routinely used to keep women out of decision-making spaces, particularly those relating to land or natural resource control. By discouraging the participation of women in decision-making, climate-driven GBV not only harms people but also denies communities a combined set of competencies and capabilities to build sustainable and resilient futures.(Franko, 2024)

These various violences are driven by a multitude of intersecting forces that span legal, social, technological, and environmental realms. In the legal realm, the lack of or inadequate enforcement of protections in crises enables violence to propagate. Interviewees explained that courts, police stations, and shelters commonly shut down during or in the aftermath of climate disasters.(Alston, 2024) During a typhoon in a Southeast Asian nation, women survivors of domestic violence were not able to reach police services or safe shelters. Perpetrators took advantage of this accountability vacuum, aware that they would face no consequences. GBV is scarcely addressed in national climate policy and disaster legislation in the majority of disaster-risk nations. The legislation does not require protective mechanisms like free, gender-responsive shelters or quick response teams for survivors. Even where in place, patriarchal bias and legal pluralism, e.g., customary land inheritance laws, undermine their application. In Uganda, women indicated that widowhood under climate stress commonly led to forced eviction by in-laws because of discriminatory traditions and loopholes in the law allowing land-grabbing with impunity.(Prakash et al., 2024) The absence of enforceable international legal commitments on GBV in climate emergencies further exacerbates the issue. Although soft law instruments such as CEDAW General Recommendation 37 call for gender-responsive climate action, they are non-binding. Law scholars in the research emphasized that states have to prevent anticipated violence stemming from foreseeable climate crises, but the obligation is poorly articulated in law and policy.

Social, cultural, and strongly entrenched gender norms still justify or legitimize violence. Disasters themselves do not lead to GBV independently; instead, they are accelerants in an already patriarchal society. As one participant aptly put it, "The disaster didn't cause the abuse, the culture did.". The storm simply lit the fuse." In the case studies, women carried out caregiving, resource gathering, and household provisioning, and, where these were made more difficult by environmental degradation, were frequently

punished for supposed failures. In one West African village, a mother was beaten after her children went hungry because of a dry well. Silence and stigma also deter reporting, especially in collective crises.(Jaggernath, 2014) Women were afraid that abuse reports from disaster situations would be regarded as selfish or disruptive. In some communities, discouragement of victim reports by leaders and framing silence as a prerequisite for coexisting in the face of adversity took place.(De la Parra-Guerra et al., 2025) Family disruption during displacement also diminished the protective monitoring by neighbors or family members. On the contrary, exploitative frameworks were further entrenched, such as the reliance on male protectors who, at times, turned into abusers. Together, climate shocks reveal and magnify structural gender inequalities, transforming everyday vulnerabilities into life-threatening hazards.(Gogarty et al., 2025)

Technology had a dual role to play. Digital technologies were mentioned both as a cause of violence and as a possible way to safety. Participants mentioned an increase in online harassment, stalking, and the use of messaging apps for intimidation during climate lockdowns and displacements. Abusers used messaging apps to send harassing messages, such as sexually explicit messages, to women, especially those who were confined in temporary camps or shelters. These attempts drew GBV into the online world, frequently outside of conventional legal solutions. Technology also provided novel types of assistance for survivors, though. One was the South African GRIT app, an artificial intelligence-powered platform co-designed with survivors to enable detailed reporting, connection to legal counsel, and emergency evidence gathering. Survivors appreciated the app particularly when conventional services were stretched. AI also enabled data-driven strategies for detection.(Moraka & Singh, 2023) For instance, natural language processing (NLP) technology monitored social media and hotline call transcripts for sudden surges in violent speech or crisis-related distress signals. Ideally, such technology can help authorities predict and respond to heightened GBV risks amidst climate events.

Yet the use of AI and digital technologies also presented grave concerns. Access was restricted in most locations; rural women, poor women, or older women simply did not have smartphones or decent internet.(Letterie, 2023) Cultural and linguistic mismatches also limited use, since most AI systems had been trained in English or metro-based settings. Data privacy was also a critical concern. Survivors were afraid that digital evidence might be used against them or fall into the wrong hands. Total confidentiality, data protection legislation, and ethical governance became the conditions for any AI-based intervention.(Adamyan, 2021) The legal institutions also need to evolve to new realities, such as the admissibility of digital evidence and the determination of liability in instances in which AI fails to protect or inflicts injury. Absent these guardrails, tech threatens to entrench the very inequities it is designed to alleviate.

Environmental issues were at the core of driving the risk environment. Sudden onset events, like cyclones, tended to result in mass displacement, with a shortage of shelter infrastructure placing women at direct risk. Slow-onset climate shifts, like sea-level rise and protracted droughts, generated long-term economic vulnerability that pushed families into unsafe survival mechanisms like child marriage or transactional sex. In a few areas, environmental degradation made women walk farther to obtain water or firewood, making them more vulnerable to sexual assault.(Bozorgi, 2023) That is, the collapse of legitimate economies in the aftermath of a disaster enabled criminal activities, like illegal logging or mining, in which GBV and exploitative labor thrived. Climate-driven migration emerged as a main risk factor, as migrant women moved without legal safeguards and were exposed to elevated levels of violence in transit and upon arrival. With projections of as many as one billion climate migrants in 2050, the potential future GBV in the absence of forward-thinking frameworks is a serious concern.(Ishchenko & Kruchinina, 2019)

3.2. Artificial Intelligence and Legal Innovation: Opportunities and Ethical Limits

With this in mind, artificial intelligence (AI) becomes a feasible, albeit not foolproof, solution. AI-powered early warning systems, when ethically developed, can flag high-risk zones and facilitate proactive deployment of protection services.(Rolfes et al., 2023) Anonymity-guaranteeing AI chatbots can offer survivors a safer, more convenient way of reporting abuse, particularly when formal channels are overwhelmed. NLP-based tools can scour the internet's trending discussions to predict GBV spikes after

disasters. Generative AI can also facilitate trauma-informed, self-conducted interviews with survivors where there is limited availability of human counselors.(Maeng & Lee, 2022) AI can be used to disseminate legal knowledge, clarify rights pertaining to land and inheritance, or present interactive educational messages in order to reverse negative norms.(Butterby & Lombard, 2025) However, before these systems can work, a number of challenges have to be overcome.(Perera-Lago et al., 2024) First is inclusivity: AI models have to be trained on representative datasets and localized to local languages and dialects. Second is accessibility: platforms have to work on low-end devices and in low-bandwidth settings.(Hatoum et al., 2025) Third is regulation: strict regulations need to be in place to ensure data privacy, promote accountability, and avoid misuse or overreach. Fourth is design ethics: survivors need to be included in the design process, with AI interfaces that are sensitive to trauma and include safety measures, such as exit buttons or automatic anonymity. Finally, legal systems must adapt to accept digital evidence, create oversight processes, and assign responsibility when AI services do not function as intended.(Di Mauro et al., 2021)

This presentation demonstrates that GBV in climate-vulnerable contexts is not marginal or incidental but one based on structural discrimination unleashed and magnified by climate change. Solutions cannot be one-size-fits-all. Legal reform needs to be coupled with gender-responsive climate adaptation, community-led norm transformation, ethical tech development, and humanitarian response with intent. Only through such a multi-faceted effort can we create strong societies where climate action and the safeguarding of women's rights are reinforcing, not rival, priorities. AI, when judiciously applied, has a part to play not as a substitute for institutional accountability, but as a spur to more responsive, inclusive, and equal systems of protection and care.

4. CONCLUSION

The study demonstrates that GBV is not an arbitrary outcome of environmental pressure within populations vulnerable to climate change but a deeply rooted structural problem, additionally catalyzed by legal, social, and economic institutional breakdown. Climate change reality fixes gendered inequalities and hastens the evolution of new patterns of violence, like domestic violence, sexual exploitation, trafficking, and violence against women who oppose environmental degradation. Here, GBV mirrors but also exaggerates eroding resilience and waning human rights. Though AI technologies have immense capacity to rejuvenate protection systems, data collection, and legal empowerment, their deployment has to be regulated strongly, holistically, and with robust standards of governance ethics. Going forward, a multi-level, practical set of policies is needed. Firstly, GBV prevention and protection must be a priority component of national disaster and climate change adaptation planning. This includes gender-sensitive shelter design as part of the plan, continuity of care services during emergencies, and mandatory GBV training for first responders.

Second, legal reform must ground enforcement of women's land and property rights, shut loopholes in family law that force women into exposure to crisis, and provide accountability for GBV in the post-disaster context. Third, states and international actors must transition towards binding international law or treaties on GBV in the climate change context beyond existing soft law instruments like CEDAW General Recommendation 37, which is non-binding. In AI and digital development, the research must have equitable and ethical application processes. AI tech development must be co-created with local individuals, women, and marginalized communities so that it becomes culturally appropriate, linguistically appropriate, and usable in low-tech and poor resource environments. These involve creating offline-capable, locale language-capable, and disability-capable platforms. Data governance must address strict privacy imperatives, such as anonymization procedures, protecting informed consent, and open data publication and ownership policies. Legal and regulatory frameworks must evolve to create governance structures and liability frameworks for AI failure scenarios, and human oversight is always preserved in all automated decision-making systems conceived to address gender-based violence challenges. Additionally, AI innovation funding must incorporate digital inclusion assistance, such as device donation, digital literacy training, and safe spaces for technology access among vulnerable populations.

Crucially, GBV in climate-challenged contexts must be addressed by moving beyond gender as a homogenous category. All responses must be led by an intersectional approach, recognizing how race, age, disability, sexual orientation, caste, religion, class, and migration status influence vulnerability and access to services. Teenage girls, elderly women, indigenous groups, LGBTQ groups, and refugees are often faced with multiple forms of climate-related issues that the traditional policy frameworks are not well-equipped to handle. The interventions, therefore, need to be adaptive, inclusive, and context-specific so that the most vulnerable groups' voices are not just incorporated but also given centrality in activities aimed at climate resilience and justice. Lastly, the study highlights the need for inclusive governance structures that incorporate climate adaptation, gender equality, and innovation in digital technology. Institutions must shift from linear models that separate environmental policy from human rights or view technology as neutral. Instead, what is required is cross-disciplinary cooperation between disciplines like legal experts, technologists, gender experts, and civic authorities for the design of inclusive systems capable of not only anticipating the real threats but also altering the trajectory of structural conditions facilitating violence.

Clim-resilient futures must be guided by principles of gender justice, right recognition, and accountable technological culture, firmly underpinned by the pillars of equity, people-centered participation, and responsibility at all levels. That is, AI can prove to be a valuable addition to GBV prevention and support in climate-vulnerable communities, but all this depends on how innovatively and responsibly it is designed and governed. Technology cannot replace political will, legal change, or social transformation. But wisely applied, technology can augment a transformational approach in which the eradication of gender-based violence is integrated into the broader agenda of climate justice, human rights, and sustainable development.

Ethical approval

This research did not require ethical approval.

Informed consent statement

This research did not require informed consent

Authors' contribution

Not applicable

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

The data presented in this study are available on request from the corresponding author due to privacy reasons.

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Notes on Contributions

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Abubakar Muhammad Jibril is a legal researcher specializing in international human rights law with a focus on women's rights and gender-based violence. He is currently affiliated with the Faculty of Law at Universitas Indonesia. His professional background includes research and policy analysis on human rights protections in Africa, particularly addressing legal and institutional gaps that affect vulnerable groups. He has contributed to several research papers and academic publications on human rights, Islamic law, and socio-legal reform. His work emphasizes bridging universal human rights standards with local contexts through culturally informed legal frameworks. He actively collaborates with legal practitioners, NGOs, and academic partners to advocate for practical reforms that advance access to justice for marginalized communities. He has presented papers at regional and international conferences and continues to develop scholarship that informs policy and supports legal reform initiatives. He can be contacted at abubakarmuhammadjibril765@gmail.com.

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