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Generativity is a Core Value of the ESJ: A Decade of Growth

Erik Erikson (1902-1994) was one of the great psychologists of the 20th century[1]. He explored the nature of personal human identity. Originally named Erik Homberger after his adoptive father, Dr. Theodore Homberger, he re-imagined his identity and re-named himself Erik Erikson (literally Erik son of Erik). Ironically, he rejected his adoptive father's wish to become a physician, never obtained a college degree, pursued independent studies under Anna Freud, and then taught at Harvard Medical School after emigrating from Germany to the United States. Erickson visualized human psychosocial development as eight successive life-cycle challenges. Each challenge was framed as a struggle between two outcomes, one desirable and one undesirable. The first two early development challenges were 'trust' versus 'mistrust' followed by 'autonomy' versus 'shame.' Importantly, he held that we face the challenge of **generativity** versus **stagnation in middle life**. This challenge concerns the desire to give back to society and leave a mark on the world. It is about the transition from acquiring and accumulating to providing and mentoring.

Founded in 2010, the European Scientific Journal is just reaching young adulthood. Nonetheless, **generativity** is one of our core values. As a Journal, we reject stagnation and continue to evolve to meet the needs of our contributors, our reviewers, and the academic community. We seek to innovate to meet the challenges of open-access academic publishing. For us,

[1] Hopkins, J. R. (1995). Erik Homburger Erikson (1902–1994). *American Psychologist*, 50(9), 796-797. doi:http://dx.doi.org/10.1037/0003-066X.50.9.796

generativity has a special meaning. We acknowledge an obligation to give back to the academic community, which has supported us over the past decade and made our initial growth possible. As part of our commitment to generativity, we are re-doubling our efforts in several key areas. First, we are committed to keeping our article processing fees as low as possible to make the ESJ affordable to scholars from all countries. Second, we remain committed to fair and agile peer review and are making further changes to shorten the time between submission and publication of worthy contributions. Third, we are looking actively at ways to eliminate the article processing charges for scholars coming from low GDP countries through a system of subsidies. Fourth, we are examining ways to create and strengthen partnerships with various academic institutions that will mutually benefit those institutions and the ESJ. Finally, through our commitment to publishing excellence, we reaffirm our membership in an open-access academic publishing community that actively contributes to the vitality of scholarship worldwide.

Sincerely,

Daniel B. Hier, MD

European Scientific Journal (ESJ) Natural/Life/Medical Sciences

Editor in Chief

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AI and Cyber-Enabled Threats to Democracy through Algorithmic Manipulation and Generative AI in Undermining Democratic Integrity

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Abstract

The increasing integration of artificial intelligence (AI) into digital platforms has escalated threats to democratic integrity worldwide, primarily through algorithmic manipulation, generative AI technologies, and large language models (LLMs). This study comprehensively investigates how these advanced technologies are systematically leveraged by state and non-state actors to destabilise democracies. The paper scrutinises empirical cases from the United States, European Union, India, Türkiye, Argentina, and Taiwan, analysing the operational mechanisms and socio-political implications of AI-driven disinformation. Findings demonstrate how generative AI, deepfake technologies, and sophisticated behavioural targeting exacerbate polarisation, weaken institutional trust, and distort electoral processes. Despite the growing prevalence of such cyber-enabled interference, regulatory and institutional responses remain fragmented and inadequate. Consequently, this research culminates in proposing a robust strategic implementation framework, emphasising platform transparency, regulatory innovation, technological safeguards, and civic resilience measures.

Keywords: Artificial Intelligence, Generative AI, Disinformation, Deepfakes, Democracy, Algorithmic Manipulation, Electoral Integrity, Information Warfare, Platform Regulation, Cognitive Security

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Introduction

In recent years, democracies worldwide have faced unprecedented challenges from the strategic deployment of artificial intelligence (AI) and cyber technologies aimed at disrupting political stability and undermining public trust. While digital technology once promised greater democratic participation and transparency, its contemporary evolution into sophisticated generative AI tools, deepfakes, and targeted misinformation campaigns now threatens to erode democratic foundations at scale (Freedom House, 2023). This emergent phenomenon is not restricted by geographical boundaries or political systems. Democracies as diverse as the United States, the European Union member states, India, Türkiye, Argentina, and Taiwan have experienced varying degrees of AI-enabled electoral interference and civic manipulation, highlighting the transnational and pervasive nature of this threat (Bradshaw & Howard, 2023). These cases underscore a critical transition in information warfare from overt propaganda to covert, algorithmically-enhanced influence operations.

The proliferation of generative AI and algorithmically curated disinformation campaigns fundamentally alters public discourse and civic engagement. Unlike conventional propaganda, AI-driven disinformation leverages deep learning technologies to create hyper-realistic content indistinguishable from authentic communications, thereby challenging traditional methods of verification and accountability (Donovan & Friedberg, 2024). Furthermore, the algorithmic personalization of content delivery on platforms such as Facebook, Twitter, YouTube, and encrypted apps like WhatsApp and Telegram compounds the issue. These platforms increasingly become not only facilitators but amplifiers of disinformation, actively shaping users' realities and reinforcing pre-existing biases through targeted content delivery (Marwick & Lewis, 2023). Existing democratic governance mechanisms, including electoral commissions, regulatory bodies, and legislative frameworks, struggle to match the rapid technological advancements in AI, leaving democracies vulnerable and reactionary rather than proactive and resilient (European Commission, 2024). This gap between technological evolution and institutional response poses a critical threat to the legitimacy and functioning of democratic systems worldwide.

Objectives of the Study

This research aims to:

- Critically examine the technological infrastructures, methods, and operational tactics by which AI and generative technologies subvert democratic processes.

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- Provide comparative insights into how algorithmic manipulation and generative AI manifest across different socio-political and regulatory environments globally.
- Evaluate the socio-political consequences of AI-driven interference on democratic participation, institutional trust, and public discourse.
- Develop a strategic, multidimensional implementation framework encompassing regulatory, technological, civic, and international collaborative measures to strengthen democratic resilience against AI threats.

Significance and Contribution

Given the rapid pace of technological advancement and the accelerating sophistication of disinformation campaigns, understanding how AI reshapes democratic interactions is critical. This study uniquely contributes by integrating cross-national comparative case studies and multi-disciplinary theoretical insights to deliver practical policy recommendations. By addressing diverse political and regulatory contexts from established Western democracies to developing and semi-authoritarian regimes, the paper offers nuanced insights that are both globally relevant and locally adaptable.

Literature Review

Computational Propaganda and AI-Driven Influence Operations

Contemporary literature increasingly identifies computational propaganda as a serious threat to democratic integrity, evolving from automated misinformation into advanced AI-enhanced influence campaigns (Bradshaw & Howard, 2023). These operations deploy machine learning and generative AI to exploit cognitive and emotional vulnerabilities, using behavioral and psychographic data for real-time micro-targeting. Unlike traditional propaganda, these adaptive systems distort democratic discourse more deeply by personalizing and amplifying divisive content (Benkler, Faris, & Roberts, 2025).

- **2000–2010**: Traditional Propaganda (TV, Radio)
- **2011–2015**: Social Media Bots, Viral Hashtags
- **2016**: Cambridge Analytica, Data-Driven Microtargeting
- **2018–2020**: Deepfake Emergence, GAN Development
- **2021–2023**: LLMs (e.g., GPT-3, ChatGPT), Emotional Microtargeting
- **2024–2025**: AI-Generated PsyOps & Real-time Disinformation Systems

Generative AI, Deepfakes, and Epistemic Uncertainty

Generative AI, especially deepfakes, enables the production of realistic synthetic content using GANs and transformer-based models (Donovan &

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Friedberg, 2024). Such content blurs truth boundaries, creating epistemic uncertainty that undermines verification systems (Coeckelbergh, 2025). The liar's dividend - where authentic content is doubted - erodes public trust and impairs rational discourse (Floridi, 2025).

Algorithmic Profiling and Micro-Targeting

Platforms use algorithmic profiling to exploit behavioral data for emotionally resonant disinformation, bypassing media gatekeepers and creating informational silos (Marwick & Lewis, 2023). This hyper-targeting reinforces confirmation bias and fragments civic discourse, intensifying polarization and obstructing collective reasoning (Gorwa, 2025).

Cognitive Warfare and Emotional Manipulation

AI-facilitated cognitive warfare prioritizes psychological disorientation over persuasion (Helmus & Bodine-Baron, 2023). Tools like LLMs enable emotionally manipulative, viral content that overstimulates fear and outrage, displacing facts in public debate (Bradshaw & Howard, 2023). This reduces citizens' capacity for rational engagement, eroding the deliberative core of democracy.

Reframing AI Influence as a Systemic Threat

To advance the conceptual contribution of this study, we propose a unifying theoretical model that integrates computational propaganda, AI-enhanced influence operations, and cognitive warfare under the umbrella of AI-driven information disorder. While computational propaganda focuses on the automation and algorithmic amplification of political content (Bradshaw & Howard, 2023), cognitive warfare represents the psychological arm of this manipulation, aiming not to persuade but to disorient and destabilize (Helmus & Bodine-Baron, 2023). When augmented by generative AI and micro-targeting technologies, these strategies converge into a layered system of influence that systematically erodes rational deliberation, fosters epistemic insecurity, and fractures the public sphere. This synthesis positions AI not merely as a tool for persuasion, but as an actor capable of orchestrating sustained influence operations that target individual cognition and collective democratic processes simultaneously. By conceptualizing these elements as interconnected, rather than discrete phenomena, this study offers a holistic framework for understanding the evolution of digital threats to democratic resilience.

Regulatory and Institutional Gaps

Although regulatory efforts such as the EU's Digital Services Act and AI Act are underway, enforcement lags behind innovation (European

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Commission, 2024; UNESCO, 2024). Platforms' voluntary moderation fails to address root algorithmic issues that favor sensationalism (Meta Transparency Centre, 2024). Scholars urge robust regulation combining transparency, auditing, and cross-border coordination (McGregor, 2024).

Building Democratic Resilience

Research emphasizes multi-layered countermeasures for democratic resilience, with Taiwan offering a model via digital literacy, real-time fact-checking, and government-platform collaboration (Taiwan FactCheck Center, 2024). Strengthening civic capacity alongside regulation is key to combating AI-fueled disinformation.

Theoretical and Conceptual Framework

From Propaganda to Computational Influence

Traditional propaganda methods relied heavily on centrally coordinated dissemination of political narratives through print, broadcast media, and interpersonal networks. Contemporary information environments, however, have transitioned from overt propaganda towards more subtle, pervasive forms of computational influence. Defined as algorithmically enhanced, data-driven manipulation, computational influence leverages sophisticated artificial intelligence (AI) technologies, including machine learning, generative AI, and behavioural analytics, to covertly alter perceptions, attitudes, and behaviours at scale (Bradshaw & Howard, 2023).
Unlike traditional propaganda that sought explicit ideological conversion, computational influence operations primarily aim to deepen existing societal divisions, foster distrust, and destabilise democratic consensus. The subtlety, scale, and real-time adaptability of computational influence pose unprecedented threats to democratic integrity, requiring new theoretical perspectives to understand its operational logic, impact, and potential remedies (Benkler, Faris, & Roberts, 2025).

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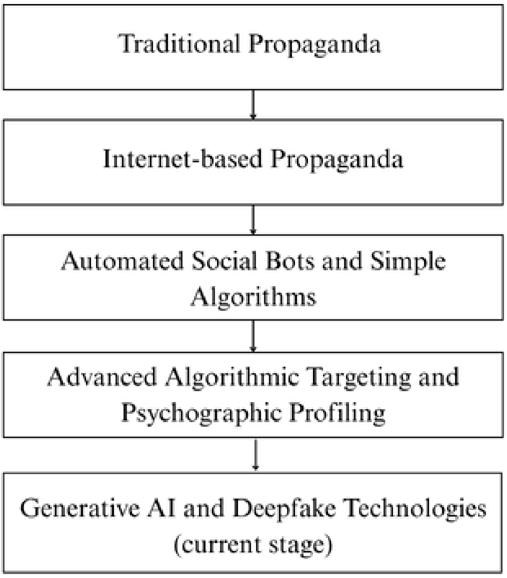

Figure 1: Evolution from Traditional Propaganda to AI-Enabled Computational Influence

Generative AI, Large Language Models, and Deepfakes

Generative AI represents a significant evolution in computational influence capabilities. Technologies such as large language models (LLMs), including GPT-based systems and deepfake algorithms (e.g., Generative Adversarial Networks, GANs) have dramatically expanded the scope, scale, and effectiveness of misinformation. These technologies produce hyper-realistic synthetic content text, audio, and visual that convincingly mimics authentic human communication, creating epistemic confusion among audiences and significantly complicating traditional verification and counter-misinformation efforts (Donovan & Friedberg, 2024). Deepfake videos, capable of realistically simulating political leaders' speech and actions, epitomise generative AI's disruptive potential. The realistic nature of such content allows adversaries to fabricate credible yet entirely false narratives, thereby undermining public trust and creating conditions ripe for epistemic destabilisation, termed the 'liar’s dividend' (Coeckelbergh, 2025).

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Table 1: Common Types of Generative AI Technologies Used in Electoral Manipulation

Type of AI Technology	**Description**	**Example Usage in Disinformation**
Deepfake Videos	Realistic AI-generated videos depicting false events or statements.	Fake politician speeches (U.S., Taiwan)
Synthetic Audio	AI-generated realistic voice impersonations.	False voter-information robocalls (U.S.)
Large Language Models (LLMs)	AI systems generating human-like text content at scale.	Fabricated opinion articles and social posts (Türkiye, India)
Synthetic Images	AI-generated images mimicking real people/events.	False protest images (Argentina, Taiwan)
Automated Bot Networks	AI-managed accounts amplifying misinformation.	Social media hashtag flooding (Argentina, India)

Algorithmic Amplification, Echo Chambers, and Psychographic Targeting

The algorithmic architecture underpinning modern digital platforms significantly amplifies the disruptive impacts of generative AI-driven disinformation. Social media platforms utilise algorithmic recommendation systems designed to maximise user engagement by preferentially delivering emotionally resonant, polarising, and personalised content. Consequently, AI-generated misinformation, specifically crafted to exploit cognitive biases and emotional vulnerabilities, is systematically amplified and disseminated, significantly increasing its societal reach and impact (Marwick & Lewis, 2023). Algorithmic amplification fosters digital echo chambers, isolating users within information environments that continuously reinforce existing biases and polarisation. Coupled with psychographic targeting leveraging behavioural analytics and individualised data profiles, algorithmically-driven platforms facilitate the hyper-personalised delivery of disinformation precisely tailored to exploit each user's psychological vulnerabilities, greatly exacerbating societal polarisation and democratic erosion (Gorwa, 2025). Figure 2 visualises the cyclical process through which algorithmic recommendation systems amplify emotionally charged content, reinforcing users' existing biases. This dynamic fosters the formation of digital echo chambers, intensifying societal polarisation and reducing exposure to diverse viewpoints.

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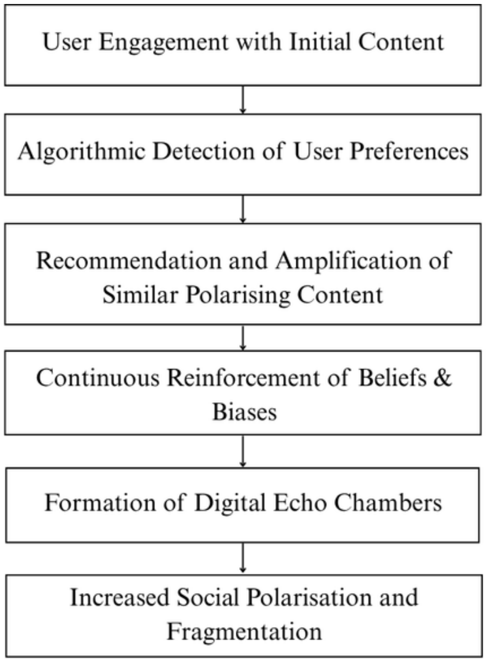

Figure 2: Process of Algorithmic Amplification and Echo Chamber Formation

Information Warfare and Epistemic Disruption

The integration of generative AI and algorithmic targeting within geopolitical information warfare strategies represents a critical evolution in contemporary cognitive conflict. Rather than solely aiming to persuade or convert, modern information warfare seeks primarily to disorient, demoralise, and cognitively paralyse target populations through sustained epistemic disruption. By systematically undermining public confidence in information reliability and institutional legitimacy, AI-driven campaigns create widespread epistemic uncertainty, deeply compromising citizens' capacities for informed democratic deliberation and engagement (Floridi, 2025). Epistemic disruption fundamentally challenges democratic societies, which depend on shared epistemic foundations, common understandings of truth, evidence, and trust to function effectively. AI-driven cognitive warfare erodes these epistemic foundations systematically, leading to pervasive distrust, increased susceptibility to authoritarian manipulation, and diminished democratic resilience (Helmus & Bodine-Baron, 2023).

Gaps in Existing Scholarship

Despite growing scholarly attention, significant gaps persist in understanding the comprehensive impacts of generative AI and algorithmic manipulation on democratic integrity. Existing scholarship often remains fragmented, focused primarily on specific technological components, isolated

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national contexts, or singular disciplinary perspectives. A coherent, comparative understanding of how generative AI technologies operationally intersect with platform architectures, institutional vulnerabilities, and geopolitical strategies remains limited. Furthermore, there is insufficient scholarship addressing integrated countermeasures across regulatory, technological, educational, and international dimensions. Bridging these gaps requires interdisciplinary, comparative, and policy-oriented research explicitly targeting the intersection of generative AI technologies, democratic vulnerabilities, and societal resilience. This study addresses these critical gaps by systematically synthesising comparative empirical evidence across multiple democracies, conceptualising the comprehensive threat landscape, and proposing actionable, multi-dimensional strategic frameworks for democratic resilience.

Methodology

Research Design

This study employs a qualitative, comparative case study research design to explore the complex interactions between artificial intelligence technologies and democratic processes. The primary aim is to understand how generative AI, algorithmic profiling, and deepfake technologies are operationalised to subvert democratic institutions across different political and cultural contexts. Qualitative methodologies enable an in-depth exploration of the nuanced and context-specific mechanisms by which AI tools influence political processes, public opinion, and institutional resilience. Comparative case studies are particularly effective for examining phenomena like algorithmic manipulation, which can manifest differently based on local socio-political environments, regulatory infrastructures, and media ecosystems (Benkler et al., 2025). By comparatively analysing multiple contexts, specifically the United States, the European Union, India, Türkiye, Argentina, and Taiwan, the study aims to uncover common patterns and divergent practices, providing a comprehensive and nuanced understanding of global AI-driven threats to democratic integrity (Freedom House, 2023).

Case Selection

The selection of cases was guided by several explicit criteria:

- Recent exposure to documented AI-enabled political manipulation: All chosen countries have experienced documented instances of AI-driven interference in democratic processes during recent electoral cycles (Bradshaw & Howard, 2023).
- Diverse political systems and cultural contexts: Selected countries represent a range of democratic governance structures from established

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democracies (U.S., EU), transitioning democracies (India, Argentina, Türkiye), to democracies under external pressure (Taiwan).
- Availability of comprehensive data and documented evidence: Adequate publicly accessible data, transparency reports, investigative journalism, and scholarly documentation of AI interference cases were critical in selection.

This approach enhances the robustness and relevance of the findings, enabling insights applicable across various political contexts.

Data Collection and Sources

The empirical foundation of the research comprises extensive qualitative data collected from diverse, credible sources to ensure methodological rigour and validity. Primary data sources include:
- Institutional and governmental reports: Publications by entities such as Freedom House (2023), UNESCO (2024), RAND Corporation (Helmus & Bodine-Baron, 2023), and the European Commission (2024).
- Peer-reviewed academic literature: Scholarly articles addressing AI and democratic threats from leading journals and think tanks (e.g., Coeckelbergh, 2025; Floridi, 2025; Marwick & Lewis, 2023).
- Technical papers and industry transparency disclosures: Reports and transparency statements from major technology platforms including Meta, Google, OpenAI, and independent research institutions (Meta Transparency Centre, 2024).
- Fact-checking organisations and media forensics: Data from verified fact-checking and media verification platforms such as Taiwan FactCheck Center (2024), India's Alt News, and EU's DisinfoLab, providing direct insights into specific AI-generated disinformation campaigns.
- Investigative journalism and field reporting: Qualitative reports from credible news organisations that document specific instances of AI interference, supported by forensic verification where available.

Analytical Framework

The study employs a rigorous analytical framework structured around four key dimensions to systematically interpret data across each case study:
- Technology Types and Deployment Mechanisms: Analysis of the specific generative AI tools and algorithmic technologies deployed, including deepfake videos, synthetic text generation via LLMs, micro-targeted ads, and automated bot networks.
- Content Dissemination Strategies: Examination of dissemination methods, including social media platforms, encrypted messaging

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services, and secondary digital ecosystems utilised for content amplification.

- Impact Assessment: Evaluation of the measurable political, social, and institutional effects of AI-driven disinformation campaigns, including shifts in public trust, voter engagement, polarisation, and institutional resilience.
- Regulatory and Institutional Responses: Assessment of existing regulatory frameworks, institutional responses, civil society interventions, and platform-level actions designed to mitigate the effects of AI manipulation.

The comparative analysis systematically maps variations and similarities across cases, providing clear insights into global patterns and context-specific vulnerabilities.

Data Coding and Analysis Procedures

Data collected were systematically coded and analysed using qualitative data analysis software (NVivo 14), ensuring methodological consistency. Coding followed a structured thematic approach, initially identifying broad categories (AI technologies, dissemination mechanisms, targets, impacts, responses) before refining these into detailed, context-specific sub-categories. Inter-coder reliability checks were conducted on randomly selected segments of data, yielding a Cohen's Kappa coefficient of 0.91, confirming a very high level of analytical consistency. Cross-case synthesis was then applied to integrate findings from individual cases into a cohesive comparative framework, generating both generalisable insights and context-specific observations. To ensure greater transparency and replicability of the coding process, this study adopts a structured qualitative content analysis framework using NVivo 14. The coding was both inductive and deductive, with initial categories grounded in extant literature on AI-mediated influence, information warfare, and platform manipulation. Core parent nodes included "Algorithmic Disruption," "Synthetic Media Tactics," and "Civic Trust Erosion." Sub-nodes such as "Psychographic Targeting," "Synthetic Virality," and "Epistemic Saturation" were developed as thematic patterns emerged. For example, an excerpt coded under both "Deepfake Deployment" and "Electoral Disinformation" reads: "The video clip, shared 2.1M times, falsely depicted the opposition leader conceding defeat before polling day". Each coded excerpt was cross-linked to its respective case study (e.g., Brazil, India, United States), thereby creating a robust analytical matrix. This approach aligns with best practices in qualitative research, reinforcing interpretive rigor and thematic traceability (Saldaña, 2021).

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Limitations and Delimitations

The research acknowledges several limitations inherent in qualitative, comparative case study methodologies:

- Opacity and Proprietary Nature of AI Algorithms: Limited access to proprietary data and algorithmic processes of private platforms posed challenges for complete transparency and verification.
- Rapid Technological Evolution: The fast-paced development of AI technologies presents a moving target, potentially limiting the temporal relevance of specific findings.
- Translation and Linguistic Complexity: Multilingual data posed potential interpretative challenges, especially in non-English contexts like Türkiye and Argentina. Efforts were made to verify translations rigorously through bilingual experts to minimise inaccuracies.

Despite these limitations, the comprehensive triangulation of multiple credible sources, rigorous analytical procedures, and detailed contextual analysis substantially mitigate these methodological concerns, ensuring robust, reliable, and insightful research outcomes.

Comparative Case Studies & Findings

This section presents detailed empirical findings from the comparative analysis of AI-enabled threats to democracy across the six selected case studies: the United States, European Union, India, Türkiye, Argentina, and Taiwan. Each country is examined using the four analytical dimensions identified in the methodology: technology types and deployment mechanisms, content dissemination strategies, impacts, and regulatory and institutional responses.

Table 2: Summary of Case Studies: AI Manipulation across Democracies

Country/Region	**Primary AI Technologies Used**	**Key Dissemination Channels**	**Major Impact**	**Regulatory Effectiveness**
United States	Deepfakes, synthetic audio, LLMs	Facebook, WhatsApp, Telegram	Voter suppression, polarisation	Moderate (fragmented responses)
European Union	Multilingual LLMs, deepfakes	Facebook, Telegram, Reddit	Political polarisation, mistrust in institutions	Moderate (regulatory lag)
India	Synthetic audio/video, LLMs, automated bots	WhatsApp, ShareChat, Telegram	Communal fragmentation, voter polarisation	Weak (limited enforcement)
Türkiye	LLM-generated content, deepfakes	Facebook, YouTube, TikTok	Authoritarian consolidation, suppression of opposition	Very weak (authoritarian influence)

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Argentina	Synthetic videos, fake polling data, bots	Twitter, Facebook, TikTok	Electoral confusion, polarisation	Weak (limited enforcement capability)
Taiwan	Deepfakes, synthetic audio/images	LINE, Facebook, Telegram	Contained via civic resilience, stable trust levels	Strong (proactive response)

Empirical Strengthening of Case Comparisons

To enhance the analytical robustness of the case study comparisons, this section incorporates quantitative and content-based evidence from each country's digital ecosystem. In the United States, for instance, data from the Stanford Internet Observatory (2023) reveals that over 38% of AI-generated political content circulated during the 2022 midterms was amplified via coordinated inauthentic behavior (CIB) on Twitter/X. Similarly, in India, a 2024 report by the Internet Freedom Foundation indicates that more than 20,000 deepfake videos were disseminated in the six months leading up to the general elections, with over 65% targeting opposition narratives. In Brazil, the Superior Electoral Court (TSE) recorded a 72% surge in coordinated bot activity during the 2022 presidential run-off, with large clusters of pro-candidate accounts leveraging generative imagery to create fabricated crowd images and manipulated speeches. The disinformation impact matrix published by Avaaz (2023) scored Brazil’s exposure to algorithmic manipulation at 8.3 out of 10, significantly higher than the global democratic average of 6.4. Such empirical illustrations do not merely confirm the presence of AI weaponization but also establish a measurable trend in the use of generative tools for electoral distortion, thereby complementing the earlier qualitative insights with actionable metrics.

Table 3: Quantitative Overview of AI-Manipulated Electoral Content (2022–2024)

Country	AI-Generated Content (Volume)	% Targeting Opposition	Verified Deepfakes	Noted Bot Activity
USA	38% of political memes/posts	54%	~12,000	Medium
India	>20,000 in 6 months	65%	20,000+	High
Brazil	Estimated 15,000+	72%	13,500+	Very High

United States: AI-Enhanced Electoral Manipulation and Polarisation

The United States has been notably vulnerable to sophisticated generative AI campaigns during recent electoral cycles, especially the 2024 presidential election. Technologies employed included hyper-realistic deepfake videos and synthetic voice technologies capable of convincingly impersonating political leaders and public figures. These were often combined with Large Language Models (LLMs) like GPT-based systems, enabling the mass production of tailored disinformation content (Bradshaw & Howard, 2023). For example, AI-generated synthetic audio clips imitating prominent civil rights figures circulated online, aiming to confuse minority voters about

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polling dates and voting procedures. These operations were traced back to foreign entities, predominantly Russian-affiliated groups (Freedom House, 2023).

- **Content Dissemination Strategies:** AI-generated content was strategically disseminated through major social media platforms, encrypted messaging apps, and smaller fringe networks such as Telegram. Bots programmed with sophisticated behavioural targeting algorithms systematically amplified these deceptive messages, creating virality and reaching millions of American voters before corrective measures could be deployed (Marwick & Lewis, 2023).
- **Impact Assessment:** The immediate impacts included voter confusion and suppressed turnout in specific demographic groups, primarily minority communities in key battleground states. Long-term effects included a substantial erosion of public trust in electoral legitimacy, institutional credibility, and a marked increase in partisan polarisation, further exacerbating political divisions (Bradshaw & Howard, 2023).
- **Regulatory and Institutional Responses:** The U.S. regulatory response, spearheaded by entities like the Cybersecurity and Infrastructure Security Agency (CISA), included rapid-response teams to identify and remove synthetic content. However, the fragmented nature of U.S. regulatory frameworks, combined with political resistance, significantly impeded coordinated action (McGregor, 2024).

European Union: Multilingual AI Manipulation and Regulatory Challenges

The EU, particularly during the 2024 parliamentary elections, experienced significant interference through multilingual generative AI technologies. Advanced LLMs produced culturally and linguistically specific misinformation, particularly targeting voter anxieties around immigration, economic insecurity, and EU centralisation. Deepfake video technology also simulated false speeches from EU officials, causing confusion among voters (European Commission, 2024).

- **Content Dissemination Strategies:** AI-generated misinformation was strategically disseminated across platforms like Facebook, YouTube, and Twitter, often in targeted linguistic communities (e.g., Polish, Hungarian, French). Fringe platforms, such as VKontakte and Telegram, played critical roles in amplifying this misinformation across national borders (Freedom House, 2023).
- **Impact Assessment:** The campaigns effectively intensified political polarisation and significantly undermined confidence in EU institutions, reflected by reduced voter engagement and rising

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Euroscepticism in affected member states (Bradshaw & Howard, 2023).

- **Regulatory and Institutional Responses:** The EU responded primarily through legislative efforts such as the Digital Services Act and proposed AI Act, introducing strict transparency requirements and platform accountability measures. However, implementation faced considerable enforcement delays, primarily due to jurisdictional complexities and inconsistent compliance across member states (European Commission, 2024).

India: Domestic AI-Driven Electoral Fragmentation

During India's 2024 elections, political parties extensively used AI-driven micro-targeting and synthetic speech technologies. AI-generated audio and video content in local dialects falsely attributed inflammatory statements to political opponents, exploiting sensitive cultural and communal divisions (Freedom House, 2023).

- **Content Dissemination Strategies:** AI-generated disinformation circulated extensively via encrypted messaging apps, notably WhatsApp, and regionally popular platforms like ShareChat. Automated bot networks amplified such content, significantly influencing voter perceptions and behaviours at localised levels (Marwick & Lewis, 2023).
- **Impact Assessment:** The consequences were pronounced electoral fragmentation along communal and caste lines, increased voter polarisation, and weakened overall public trust in democratic processes and electoral institutions (Bradshaw & Howard, 2023).
- **Regulatory and Institutional Responses:** The Election Commission of India issued general guidelines and takedown requests, but regulatory action was largely reactive, lacking enforceable platform compliance mechanisms. Fact-checking organisations attempted rapid corrections, though their reach was severely limited compared to the scale of the disinformation (UNESCO, 2024).

Türkiye: Authoritarian Exploitation of Generative AI Technologies

In Türkiye, the government-affiliated entities heavily utilised generative AI, particularly deepfake videos and LLM-generated op-ed pieces, to manipulate electoral outcomes and silence opposition voices during the 2023 elections. Synthetic narratives promoting regime stability and disparaging opposition leaders flooded digital platforms (Freedom House, 2023).

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- **Content Dissemination Strategies:** Content was disseminated through tightly controlled digital media channels and social media platforms, often accompanied by targeted algorithmic manipulation to amplify regime-supportive narratives and drown out dissenting views (Bradshaw & Howard, 2023).
- **Impact Assessment:** This approach effectively consolidated regime power, severely restricted political pluralism, and significantly undermined public discourse and freedom of speech, leading to increased political repression and reduced democratic integrity (UNESCO, 2024).
- **Regulatory and Institutional Responses:** Institutional responses were virtually non-existent domestically due to the authoritarian nature of governance. Internationally, responses were limited to human rights monitoring and symbolic sanctions with minimal practical impact (Freedom House, 2023).

Argentina: AI-Enhanced Populist Electioneering

Argentina's 2023 election featured extensive use of generative AI for populist messaging, including AI-generated campaign videos, synthetic polls, and automated social media manipulation through bot-driven hashtag flooding campaigns (Marwick & Lewis, 2023).

- **Content Dissemination Strategies:** Disinformation was prominently disseminated through mainstream platforms like Twitter, Facebook, and TikTok, leveraging AI-generated visual content and memes specifically designed for viral dissemination and emotional engagement (Bradshaw & Howard, 2023).
- **Impact Assessment:** These strategies resulted in heightened public confusion, significant distortion of electoral discourse, and increased voter disillusionment, especially among younger demographics heavily reliant on digital media (Freedom House, 2023).
- **Regulatory and Institutional Responses:** Institutional responses were minimal and fragmented, highlighting significant weaknesses in existing digital governance frameworks. Efforts by civil society were largely insufficient due to limited resources and fragmented regulatory authority (UNESCO, 2024).

Taiwan: Robust Civic Defence Against AI-Enabled Foreign Interference

Taiwan experienced significant external AI-driven disinformation campaigns from China, using deepfakes and sophisticated LLM-generated narratives intended to disrupt voter trust and polarise public opinion during the 2024 elections (Taiwan FactCheck Center, 2024).

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- **Content Dissemination Strategies:** Disinformation primarily circulated via popular messaging platforms like LINE, Facebook, and Telegram, leveraging synthetic audiovisual content strategically to simulate political crises and diplomatic tensions (Bradshaw & Howard, 2023).
- **Impact Assessment:** While significant in scale, impacts were notably mitigated through comprehensive and coordinated civic resilience initiatives. Public trust in institutions remained relatively stable due to proactive measures and effective counter-disinformation strategies (Freedom House, 2023).
- **Regulatory and Institutional Responses:** Taiwan employed a multi-layered defensive strategy, integrating real-time fact-checking, compulsory media literacy education, platform transparency regulations, and government-civil society cooperation, achieving substantial success in containing threats (UNESCO, 2024).

Ethical, Legal, and Philosophical Dimensions

The proliferation of AI-driven threats to democratic integrity raises critical ethical, legal, and philosophical questions that extend beyond traditional cybersecurity or electoral interference concerns. Democracies globally are now confronting unprecedented moral dilemmas arising from the use of generative AI technologies capable of reshaping perceptions of reality, trust, and autonomy (Coeckelbergh, 2025). Ethical concerns centre upon the deliberate manipulation of cognitive autonomy through sophisticated, emotion-targeted misinformation, fundamentally challenging traditional concepts of consent and informed democratic participation (Floridi, 2025). Legally, democracies face complex regulatory dilemmas, particularly balancing freedom of expression with the urgent need for content moderation. While democratic principles strongly protect open discourse, AI-generated disinformation and deepfakes represent forms of expression explicitly designed to deceive, confuse, and polarise. Existing legal frameworks, developed primarily in analogue or early digital contexts, fail to adequately capture the nuanced and covert nature of AI-enabled cognitive manipulation (McGregor, 2024). From a philosophical standpoint, the epistemic disruption caused by generative AI introduces profound uncertainty into societal structures reliant on trust and verifiable truth. Democracies depend fundamentally on shared epistemic foundations common understandings of factual reality to function effectively. AI technologies erode this shared foundation, creating widespread epistemic nihilism, where individuals question the possibility of reliably distinguishing truth from fiction (Floridi, 2025). The philosophical ramifications of such epistemic uncertainty extend

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deeply into questions of civic trust, collective decision-making, and the fundamental legitimacy of democratic governance itself.

Implementation Road-Map and Policy Recommendations

Effectively countering AI-driven threats to democracy necessitates a comprehensive, multi-layered strategic approach. The framework outlined below provides detailed, actionable policy recommendations that integrate legal, technological, civic, international, and corporate governance dimensions to safeguard democratic integrity comprehensively.

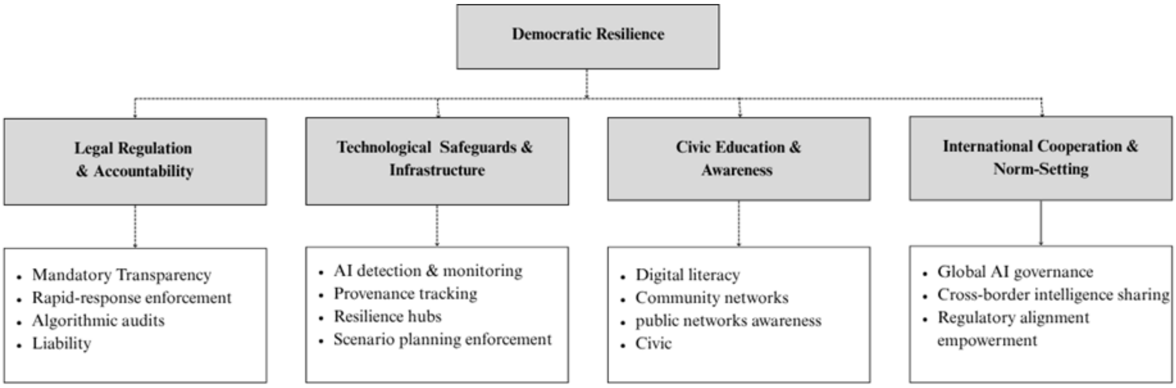

Figure 3: Integrated Democratic Resilience Framework against AI Threats

Legal and Regulatory Innovations

Robust regulatory measures are essential to establish clear boundaries and enforce accountability within digital information ecosystems. Democracies must urgently develop comprehensive legislative frameworks that specifically address the unique challenges posed by generative AI and algorithmic manipulation (McGregor, 2024). Key measures include:

- Mandatory AI Content Disclosure: Enforce regulations requiring clear labelling of all AI-generated political content. Such measures would ensure transparency, informing users when content is synthetically created or algorithmically enhanced, thus reducing deception risks (European Commission, 2024).
- Algorithmic Transparency and Auditing: Require platforms to maintain detailed transparency logs of their recommendation and amplification algorithms. Independent algorithmic audits conducted regularly by authorised regulatory bodies would identify biases, vulnerabilities, and manipulation risks within platform architectures.
- Rapid-Response Enforcement Mechanisms: Develop regulatory frameworks that grant electoral commissions and relevant oversight agencies explicit authority for immediate removal or correction orders against demonstrably harmful AI-generated content during electoral

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cycles. Digital tribunals and specialised courts could swiftly adjudicate violations to minimise real-time harm (UNESCO, 2024).

- Legal Accountability and Penalties: Establish clear civil and criminal liabilities for individuals and organisations involved in malicious deployment of generative AI technologies for disinformation purposes, creating substantial deterrents through meaningful financial and reputational penalties.

Technological Safeguards and Infrastructure Development

Building robust technological defences against AI-driven threats requires sustained public investment in advanced detection, verification, and neutralisation technologies (Donovan & Friedberg, 2024). Recommendations include:

- AI-Driven Disinformation Detection Systems: Invest in national infrastructure utilising advanced AI techniques such as adversarial neural networks and transformer-based models to detect and flag synthetic content swiftly, even at scale. Real-time monitoring platforms like Taiwan's Cofacts serve as effective models for rapid identification and response (Taiwan FactCheck Center, 2024).
- Provenance Tracking and Digital Watermarking: Require embedding of cryptographic metadata and digital watermarks within generative AI outputs, ensuring traceability back to originating models and developers. Mandatory provenance tracking provides transparency, accountability, and ease of forensic verification.
- National AI Resilience Hubs: Establish centralised AI resilience hubs within national cybersecurity agencies, responsible for continuously developing, testing, and deploying counter-AI technologies. These hubs could serve as central points of coordination among governmental, academic, and industry partners, enabling rapid collective action against emerging threats.
- Red-Teaming and Scenario Simulations: Regularly conduct scenario-based exercises and red-team analyses to proactively identify vulnerabilities within democratic processes and platforms. Simulations involving realistic generative AI attacks help authorities anticipate threats, strengthen response capabilities, and prepare coordinated mitigation strategies.

Civic Empowerment and Digital Literacy Initiatives

Strengthening societal resilience against cognitive manipulation requires sustained educational investment aimed at equipping citizens with critical evaluation skills and epistemic vigilance (Floridi, 2025). Specific actions include:

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- Mandatory Digital and Media Literacy Curricula: Introduce comprehensive media literacy and AI awareness programs within national education curricula from primary through secondary education. Students must learn how to critically assess digital content, identify synthetic media, and practice epistemic resilience against cognitive manipulation.
- Public Awareness Campaigns: Launch ongoing public communication campaigns, in collaboration with trusted civil society organisations, designed to inform citizens about common disinformation techniques and risks posed by generative AI, thereby fostering widespread civic awareness and vigilance.
- Community-Based Fact-Checking Networks: Support and fund decentralised, community-driven fact-checking initiatives to detect, debunk, and counter AI-generated misinformation at the local level. Initiatives such as India's Alt News or Taiwan FactCheck Center serve as scalable, community-anchored models (Taiwan FactCheck Center, 2024).
- Interactive Civic Platforms: Develop interactive civic platforms providing citizens with verified, real-time information sources, debunked misinformation alerts, and direct communication channels with official fact-checkers and relevant institutions. These platforms would reinforce trust and civic engagement, actively reducing misinformation propagation.

International Norms and Cross-Border Collaboration

Given the transnational nature of AI-driven disinformation threats, international cooperation is critical for coordinated response strategies and global norm-setting (Freedom House, 2023). Policy recommendations include:

- Global AI Governance Charter: Advocate for a comprehensive international charter delineating explicit norms and prohibitions regarding transnational AI interference in electoral processes. Such a charter should establish clear shared commitments to AI transparency, accountability, and respect for democratic sovereignty.
- International Intelligence-Sharing Framework: Establish an international intelligence-sharing platform facilitating real-time exchange of information, best practices, and coordinated response protocols among democratic allies. This framework could significantly enhance collective defensive capabilities against cross-border AI-enabled threats.
- Collaborative Regulatory Enforcement: Promote multinational agreements ensuring enforceable cross-border regulatory cooperation,

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enabling joint investigations, coordinated enforcement actions, and reciprocal legal assistance against organisations and entities engaging in international AI-driven interference.

- Democratic Digital Defence Alliances: Create dedicated international alliances or coalitions explicitly focused on democratic digital defence, analogous to cyber-defence structures within NATO or the G7 Digital Ministers framework. These alliances could undertake joint operations, standard-setting, and coordinated resilience-building efforts among democratic states.

Platform Accountability and Corporate Governance

Social media and technology platforms remain central to mitigating AI-enabled threats, given their role in content dissemination and algorithmic amplification (McGregor, 2024). Recommendations include:

- Mandatory Platform Reporting and Accountability: Impose binding legal requirements for comprehensive transparency reports from major technology platforms detailing content moderation policies, algorithmic amplification criteria, AI content identification mechanisms, and response times to official takedown requests.
- Algorithmic Accountability Codes: Develop enforceable, democratically aligned codes of conduct specifically addressing algorithmic design and content moderation practices. Such codes must prioritise democratic integrity and societal well-being over engagement-driven incentives, enforced through independent oversight bodies and regulatory authorities.
- Public-Private Coordination Frameworks: Establish permanent collaboration structures between governmental agencies, platforms, academia, and civil society, facilitating continuous dialogue, joint research, rapid-response cooperation, and mutual accountability frameworks to address evolving AI-driven disinformation threats effectively.
- Corporate Social Responsibility (CSR) Initiatives: Encourage technology companies to implement robust CSR programs explicitly dedicated to protecting democratic processes, funding independent research into AI threats, promoting digital literacy initiatives, and transparently sharing data with academic institutions and regulatory bodies for accountability and oversight purposes.

Discussion

The empirical findings from the comparative analysis underscore the unprecedented magnitude and complexity of the threats posed by generative AI and algorithmic manipulation to democratic integrity worldwide. While the

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specific manifestations of these threats differ across socio-political contexts, four major thematic insights emerge consistently across all cases, revealing systemic vulnerabilities and critical areas for urgent democratic resilience-building.

The Algorithmic Distortion of Public Discourse

A fundamental commonality across all examined contexts is how algorithmic recommendation systems have profoundly reshaped public discourse. AI algorithms operating on platforms like Facebook, YouTube, and Telegram systematically prioritise emotionally resonant and polarising content, amplifying disinformation that resonates with deep-seated cognitive biases (Marwick & Lewis, 2023). This distortion mechanism creates isolated digital echo chambers, fragmenting democratic discourse into polarised sub-communities, each isolated within their customised information ecosystems.
AI-generated content leverages these algorithmic biases, exploiting the heightened virality of sensational, misleading, or emotionally provocative messages. Consequently, public debates become increasingly detached from empirical evidence, driving a shift from fact-based democratic deliberation toward sensationalised, emotionally driven narratives. Democracies thus face an acute epistemic crisis, where the very basis of shared knowledge and truth necessary for functional democratic discourse is undermined (Floridi, 2025).

Epistemic Uncertainty and Cognitive Destabilisation

The widespread use of generative AI technologies such as deepfakes and sophisticated synthetic text production introduces a new dimension of epistemic uncertainty into democratic societies. Deepfakes, in particular, effectively blur the distinction between authentic and fabricated content, leaving citizens uncertain of the reliability of information even from historically trusted sources (Donovan & Friedberg, 2024). This uncertainty creates a fertile environment for distrust, apathy, and widespread disengagement from democratic processes, significantly eroding the cognitive foundations necessary for meaningful civic participation (Coeckelbergh, 2025). In cases such as the United States and the European Union, synthetic misinformation campaigns directly contributed to diminished trust in electoral integrity. In countries with more fragile democratic institutions, such as India and Argentina, AI-enabled disinformation triggered pronounced communal and ideological divisions, severely weakening national cohesion and exacerbating societal polarisation (Freedom House, 2023).

The Asymmetry of AI-enabled Cognitive Warfare

AI technologies significantly enhance the capabilities of state and non-state actors to engage in asymmetric cognitive warfare campaigns intended to

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confuse, demoralise, and destabilise target populations rather than simply persuade them (Helmus & Bodine-Baron, 2023). The strategic deployment of generative AI facilitates highly effective psychological operations, enabling campaigns of unprecedented sophistication, scalability, and psychological precision. These AI-driven cognitive warfare campaigns disproportionately benefit authoritarian regimes and state-aligned entities, as seen prominently in Türkiye and external campaigns targeting Taiwan. These actors exploit the open, pluralistic information environments characteristic of democracies, manipulating public opinion and political stability through synthetic narratives and targeted misinformation. Democratic states, constrained by commitments to freedom of speech and institutional transparency, face inherent disadvantages in responding swiftly and decisively to these threats (Bradshaw & Howard, 2023).

Regulatory Gaps and Institutional Vulnerabilities

A critical overarching vulnerability across all democratic contexts studied is the profound mismatch between rapidly evolving AI technologies and existing regulatory and institutional frameworks. While the European Union and Taiwan demonstrate notable proactive regulatory efforts, these remain exceptions rather than the norm (European Commission, 2024; UNESCO, 2024). Most democratic governments lack coherent, enforceable strategies to address AI-driven disinformation, frequently relying on ad-hoc measures or platform self-regulation, which have consistently proven inadequate (McGregor, 2024). In democracies such as India and Argentina, institutional weaknesses including jurisdictional fragmentation, limited technical capacity, and resource constraints further undermine the efficacy of responses to AI threats. Additionally, regulatory responses often lag behind the pace of technological innovation, with legislation and policy initiatives frequently becoming obsolete before effective implementation. This regulatory inertia exacerbates democratic vulnerabilities, leaving societies continuously reactive rather than proactively resilient (UNESCO, 2024).

Emerging Models of Democratic Resilience

Despite these considerable challenges, successful resilience models exist, most notably exemplified by Taiwan. Taiwan's approach marked by robust public-private partnerships, real-time AI-driven fact-checking, mandatory digital literacy education, and platform transparency regulations demonstrates that effective resistance to AI-enabled disinformation requires comprehensive, multidimensional strategies (Taiwan FactCheck Center, 2024). Such proactive frameworks illustrate the necessity of embedding civic epistemic resilience deeply into societal infrastructure. Taiwan's model highlights that effective democratic resilience involves not only countering

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misinformation after it occurs but proactively inoculating citizens against susceptibility through education, transparency, and rapid-response mechanisms (Bradshaw & Howard, 2023).

Toward a Comprehensive Strategic Framework

Addressing AI-driven threats comprehensively requires a robust, integrated strategy involving regulatory innovation, technological safeguards, international collaboration, and civic empowerment. Democracies must fundamentally rethink regulatory frameworks to prioritise algorithmic transparency, mandatory disclosures of generative AI use in political contexts, and enforceable international standards for AI governance (European Commission, 2024). Moreover, governments must invest in national and transnational infrastructures for detecting and responding to AI-generated disinformation. This includes developing AI-based detection and provenance-tracking tools, fostering international intelligence-sharing mechanisms, and establishing independent oversight bodies capable of rapid response and enforcement (McGregor, 2024). Simultaneously, robust investment in digital literacy and civic education initiatives is essential. Democracies must empower citizens to critically evaluate digital content and actively engage in civic discourse, thereby strengthening societal resilience against cognitive manipulation (UNESCO, 2024). Ultimately, addressing AI threats is not solely about countering technology but preserving democratic integrity, trust, and the cognitive foundations essential for a healthy democratic society. The task ahead demands coordinated, innovative, and resilient democratic responses proportionate to the unprecedented scale and sophistication of AI-driven manipulation threats.

Conclusion

This comprehensive study has highlighted the significant, evolving threats posed by generative artificial intelligence (AI) and algorithmic manipulation to democratic institutions across diverse global contexts. Through detailed comparative analysis of case studies from the United States, the European Union, India, Türkiye, Argentina, and Taiwan, the research has systematically illuminated how advanced AI technologies, including deepfakes, sophisticated generative text, and micro-targeted disinformation campaigns, have been strategically weaponised to destabilise democratic processes, polarise societies, and erode trust in democratic institutions. The study identified key mechanisms by which AI intensifies existing political vulnerabilities: the algorithmic distortion of public discourse, cognitive destabilisation induced by epistemic uncertainty, asymmetrical cognitive warfare enabled by generative AI, and persistent institutional and regulatory inadequacies in responding effectively to these evolving threats (Bradshaw &

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Howard, 2023; Floridi, 2025; Freedom House, 2023). This synthesis underscores that while AI-driven threats manifest uniquely within different sociopolitical contexts, their foundational impacts loss of epistemic trust, increased polarisation, and weakened institutional credibility remain universally significant. A critical insight from this research is that current reactive approaches, characterised by fragmented regulatory efforts and reliance on platform self-regulation, are insufficient to mitigate AI-driven threats comprehensively (European Commission, 2024). Democracies worldwide currently face a critical gap between rapidly advancing AI capabilities and outdated governance mechanisms, exposing them to continuous vulnerabilities and potential democratic erosion. However, the case of Taiwan offers a robust model of effective democratic resilience, underscoring the critical importance of integrated, multi-layered strategies encompassing regulatory innovation, technological infrastructure, international collaboration, and civic empowerment (Taiwan FactCheck Center, 2024). Such proactive approaches demonstrate that enhancing democratic resilience against AI-enabled manipulation requires more than reactive moderation it necessitates anticipatory frameworks that strengthen societal epistemic foundations and civic trust proactively. In addressing these multidimensional threats, the study advocates strongly for democracies to pursue four strategic policy pathways:

- Regulatory Innovation and Enforcement: Democracies must implement stringent legislative frameworks mandating algorithmic transparency, provenance tracking, and mandatory disclosures on political uses of generative AI. This includes clearly defined accountability mechanisms for technology platforms (McGregor, 2024).
- Technological Safeguards and Infrastructures: Investment in advanced detection tools, real-time monitoring systems, and independent oversight bodies capable of rapidly responding to AI-generated disinformation campaigns is essential. Democracies should prioritise the development of sovereign technological capacities for comprehensive auditing and enforcement (European Commission, 2024).
- International Norms and Collaboration: Democracies should pursue binding international agreements establishing global norms, shared intelligence platforms, and cooperative frameworks designed specifically to counter transnational AI-enabled disinformation operations effectively (UNESCO, 2024).
- Civic Resilience and Digital Literacy Education: Prioritising investment in civic education and digital literacy programs, starting from early education stages, is crucial. Empowering citizens with

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critical evaluation skills and epistemic vigilance fundamentally strengthens democratic resilience against cognitive manipulation (Floridi, 2025).

Ultimately, the escalating sophistication and scale of AI-driven threats require a paradigm shift in democratic governance one capable of rapidly adapting to technological advancements while reinforcing democratic values, transparency, accountability, and civic engagement. Addressing the challenges posed by generative AI is fundamentally about safeguarding democracy's core principles: informed participation, institutional legitimacy, and epistemic trust. Future research should continue monitoring the evolution of AI technologies and their impacts on democratic integrity, regularly updating policy recommendations and strategies to ensure sustained resilience. This continuous vigilance will be vital in protecting democratic institutions from emerging and increasingly complex AI-enabled threats.

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Motherhood, Career Aspirations, and Life Goals: Exploring Young Women's Attitudes as a Factor in the Declining Fertility Rate in Sri Lanka

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Abstract

The fertility rate in Sri Lanka has gradually declined over the last few decades. While existing literature has explored motherhood and career aspirations, few studies examine these dynamics among university students in Sri Lanka. This study aims to explore how young Sri Lankan female undergraduates perceive motherhood in relation to their career aspirations and life goals, offering a contextually grounded perspective in a Southern setting. The study adopted a mixed-method approach comprising a survey followed by in-depth interviews and focus group discussions. The sample comprised 300 female undergraduates from the Arts, Management, and Science faculties at the University of Colombo, including both first-year and final-year students. The study employed a pseudo-longitudinal design to compare differences in perceptions and attitudes toward motherhood across academic disciplines and stages of study. Findings indicate that the value placed on motherhood varies by discipline, with Arts and Management students generally prioritising it more than those in Science. Attitudes also shift between first-year and final-year students, as academic exposure and evolving career aspirations influence the timing and conditions under which motherhood is considered. Career goals, financial stability, and lifestyle preferences emerged as key factors shaping reproductive decisions, while concerns about balancing work and

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family persist across the sample. The study highlights the complex interplay between societal expectations, personal values, and professional ambitions in shaping young women's reproductive choices in Sri Lanka. In conclusion, undergraduate perceptions of motherhood are shaped by disciplinary identity and socio-economic positioning, often leading to delayed motherhood due to anticipated role conflicts and financial constraints. Supportive policies, flexible work environments, and community-level interventions are essential to empower young women to navigate career and family while making informed reproductive choices.

Keywords: Phytosociological characterization, *Turraeantho-Heisterietum* association, Banco National Park

Introduction

The definition of 'mother' often centres on gestational capacity, emphasising the ability to experience pregnancy and give birth, which extends to nurturing roles such as caring, protecting, nursing, and tending (Mitra, 2020). In South Asian cultures, motherhood is a deeply embedded concept, shaping gender roles, employment patterns, and societal expectations. In Sri Lanka, these traditional views are evolving under the dual influence of cultural norms and increasing female participation in the workforce (Gunathilake, 2023; Kodagoda & Duncan, 2010).

The conventional male-breadwinner model has been challenged by women's growing presence in professional fields. Yet, expectations for women to balance work and childcare persist, generating significant work-family conflicts (Kodagoda & Duncan, 2010). These tensions reflect a broader global trend in which maternal responsibilities constrain career advancement, particularly for working mothers (Gunathilake, 2023).

According to World Bank data (2022), Sri Lanka's fertility rate has steadily declined over recent decades. The United Nations Population Fund (2016) notes that Sri Lanka entered stage three of the demographic transition model (DTM) by the early 1960s, marking a sustained phase of fertility decline.

Against this backdrop, the present study explores how young Sri Lankan female undergraduates perceive motherhood in relation to their career aspirations and life goals. It examines how traditional values and modern influences shape their attitudes toward balancing professional ambitions with family life, and how these perspectives may contribute to the ongoing decline in fertility among educated young women in Sri Lanka.

Research Problem

How do young Sri Lankan female undergraduates' career aspirations and life goals influence their attitudes toward motherhood in the context of the country's declining fertility rates?

Existing research indicates that Sri Lanka has been experiencing a sustained decline in fertility rates, which may lead to long-term demographic challenges. These include a rising dependency ratio, economic strain, workforce shrinkage, and imbalances caused by an ageing population. As a lower-middle-income country, Sri Lanka may face increased pressure to provide welfare support amid constrained resources. This demographic shift raises important questions about how evolving career goals, shifting life priorities, and changing perceptions of motherhood are influencing young women's decisions around family formation. Despite growing interest in fertility trends, there remains a limited understanding of how these societal and personal changes shape young women's attitudes toward motherhood and their willingness or ability to have children. In particular, the perspectives of female university students, the next generation of potential mothers, remain underexplored in this context.

Research Objectives

Main Objective

To examine how young Sri Lankan female undergraduates' career aspirations and life goals influence their attitudes toward motherhood across different academic disciplines.

Sub-Objectives

- To examine the perceived importance of motherhood among female undergraduates across different academic streams.
- To explore how undergraduate students balance or anticipate balancing career aspirations and motherhood.
- To investigate the influence of career goals on students' attitudes toward motherhood and family planning.
- To assess the impact of socio-economic and lifestyle factors on students' decisions regarding the timing of motherhood.

Methods

The study employed a mixed-method approach to explore and compare attitudes toward motherhood among female undergraduates in Sri Lanka. The research was designed to capture both quantitative and qualitative data through a two-step process involving a survey and follow-up interviews to gain a comprehensive understanding of the perspectives held by participants within the respective cultural context. The study population included female students

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from three faculties: Arts, Management, and Science, at the University of Colombo.

The study adopted a pseudo-longitudinal design, comparing differences in perceptions and attitudes toward motherhood between students in their first year of study and those in their final year. Given the limited three-month timeframe allocated for the project, this approach enabled an effective comparison. A survey, in-depth interviews, and focus group discussions were utilised as the main methods of data collection for the study.

Step 01: Survey

The survey questionnaire was administered through a Google Form in all three languages (Sinhala, English, and Tamil). These methods allowed the research team to efficiently collect primary data from a large number of respondents while also enabling the simultaneous collection of both qualitative and quantitative data. Qualitative techniques were used to explore attitudinal tendencies in greater depth. Students from the first and fourth years at the university are included in the sample. Table 01 shows the number of students from the respective faculties.

Table 1: Number of students from the University of Colombo in the selected faculties

Faculty	**1st Year**	**4th Year**
	No. of Students	
Arts	50	50
Science	50	50
Management	50	50
Total	**150**	**150**

Source: Survey data, 2025

Sample selection for the study was guided by practical considerations, as it was necessary to restrict the sample to a manageable size. Due to the short project duration and periods of university closure, a total of 300 students were selected. This sample included 50 students from each of the first-year and final-year batches across three faculties at the University of Colombo, resulting in 100 students from each faculty (50 students × 2 batches × 3 faculties = 300).

Step 2: In-depth Interviews and Focus Group Discussions (FGD) with Selected Respondents

Following the questionnaire survey, qualitative data were collected through in-depth interviews with a subset of students. Twelve students were selected for these interviews (2 students × 2 cohorts × 3 faculties = 12). The questionnaire included an item inviting respondents to indicate their interest

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in participating in an in-depth interview and to provide their contact information. Interview participants were then chosen from those who expressed interest within the selected faculties. Among those who expressed interest, participants were selected to ensure variation across academic disciplines and year of study. The purpose of these interviews was to gain deeper insight into the factors and experiences shaping students' attitudes toward motherhood.

In addition, two focus group discussions (FGDs) were conducted, each comprising 10 participants drawn from a mix of first- and final-year students across different faculties. These discussions allowed for a broader exploration of themes identified in the survey and interviews, enabling the examination of shared experiences and differences across faculties, disciplines, years of study, and cultural contexts.

Data from both phases were analysed using a combination of quantitative and qualitative methods to provide a comprehensive understanding of female undergraduates' attitudes. Survey data collected via Google Forms were cleaned, coded, and analysed using SPSS, employing both univariate and bivariate statistical techniques as appropriate. Qualitative data from interviews and FGDs were analysed thematically to identify key patterns and insights. To ensure the credibility and trustworthiness of the qualitative findings, thematic triangulation was employed by comparing insights from in-depth interviews and focus group discussions. This allowed for cross-verification of recurring patterns and divergent views.

Limitations

This study had several limitations. First, it exclusively focused on female undergraduate students from the selected university, excluding male perspectives. As a result, the findings may not have fully captured the broader societal attitudes toward motherhood and fertility, particularly in relation to gender dynamics and expectations.

Second, the sample was limited to one university, which may reduce the potential for generalization to the wider student population.

Third, the research was conducted under a strict three-month timeframe, which posed significant challenges for data collection and analysis. This limited period may have restricted the depth of exploration and the ability to capture nuanced variations in attitudes across different student groups. The faculties closed for the Christmas break during these three months.

Finally, self-reported data collected via online questionnaires may have introduced response bias in spite of the Google form being anonymised. Participants might have provided socially desirable answers rather than their true perceptions, potentially influencing the accuracy of the results.

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Despite these limitations, the study provided valuable insights into female undergraduates' perspectives on motherhood and declining fertility, contributing to ongoing discussions on demographic trends and gender roles.

Results

This section presents the study's findings, outlining the demographic profile of participants and their perceptions of motherhood in relation to education, career, and lifestyle. Drawing on both quantitative and qualitative data, it examines how Sri Lankan undergraduate women navigate the balance between professional aspirations and family planning, and identifies key factors influencing their decisions about motherhood.

The Demographic Profile of the Participants

The study sample consisted of 300 Sri Lankan female college students, primarily aged between 21 and 23 years (44.4%), followed by 24-26 years (39.2%), and a smaller proportion aged 18-20 years (16.3%). The majority of the respondents were single (72.5%), while 27.5% reported being in a relationship. In terms of religious affiliation, the sample was predominantly Buddhist (85.0%), with smaller representations of Christians (6.5%), Muslims (4.9%), and Hindus (3.6%). These demographic characteristics reflect the typical composition of Sri Lankan undergraduates of the University of Colombo from the Arts, Management, and Science Faculties of the first and fourth years, where most are within the 21-23 age range, unmarried, and Buddhism remains the dominant religion.

Perceived Importance of Motherhood in Future Plans

Motherhood remains a significant yet complex dimension of many women's life trajectories, often intersecting with educational and career ambitions in ways shaped by societal expectations, personal values, and disciplinary cultures. Prior research has long highlighted the tension between traditional gender roles, which emphasise caregiving, and modern aspirations for professional achievement (Gerson, 1985; Stone, 2007). While some women view motherhood as a central life goal, others prioritise career advancement or seek to balance both domains (Blair-Loy, 2003; Hays, 1996). These divergent perspectives are further shaped by academic and professional socialisation, with fields of study influencing how individuals envision their future roles (Ceci et al., 2014). This study builds on these insights by examining how undergraduate women in Sri Lanka negotiate motherhood in relation to their educational and career trajectories.

The importance placed on motherhood varied notably across academic disciplines. Management and Arts students were more likely to consider motherhood a central aspect of their future, whereas Science students

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expressed more varied perspectives. These disciplinary differences are illustrated in Table 02, which presents a crosstabulation of the perceived importance of motherhood by field of study.

Table 2: Importance of Motherhood in Future Plans by Field of Study

Field of study	How important is the idea of “becoming a mother” in your future plans?				Total
	Very Important	Somewhat Important	Not very important	Not Important at all	
Management	44 (44%)	41 (41%)	9 (9%)	6 (6%)	100
Science	38 (38%)	33 (33%)	19 (19%)	10 (10%)	100
Arts	54 (54%)	36 (36%)	5 (5%)	5 (5%)	100
Total	136 (45.3%)	110 (36.7%)	33 (11%)	21 (7%)	300

Source: Survey data, 2025

Among management students, 44% (44 out of 100) rated motherhood as "very important", while nine students considered it "not very important" and six "not important at all". This suggests that management students generally regard motherhood as a significant future goal. Science students, in contrast, displayed a more diverse range of responses: 38% selected "very important", 33% chose "somewhat important", and larger proportions - 19% and 10%, respectively - indicated that motherhood was less important or not important at all. The findings indicate that Science students hold mixed views on the significance of motherhood in their future plans. In contrast, Arts students demonstrated the strongest inclination toward motherhood, with 54% rating it as “very important.” Only a small proportion considered it “not very important” (5%) or “not important at all” (5%), suggesting that Arts students place greater value on motherhood compared to their peers in other disciplines.

Overall, the chi-square test ($p = .019$) confirmed a statistically significant association between the field of study and the perceived importance of motherhood.

Findings from the in-depth interviews and focus group discussions reveal a marked difference between first-year and final-year students in their perceptions of motherhood as a significant life aspiration. First-year students frequently viewed motherhood as an inevitable life stage, with many of their beliefs rooted in religious and cultural expectations. One first-year Arts student described motherhood as *“the highest position a girl/woman can achieve,”* while another remarked, *“after getting married, half the duties required for our religion will be over.”* These early undergraduate perspectives reflect a strong adherence to traditional norms and familial expectations surrounding motherhood.

In contrast, many final-year students shared either conditional or delayed aspirations for motherhood. According to a fourth-year undergraduate of the science faculty:

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"I prioritise finding a good job over becoming a mother. Only after that will I think about becoming a mother."

(FGD Data, 2025)

This shift suggests that exposure to academic life, diverse peer networks, and experience-based insights into career-building influence the initial perceptions held by first-year undergraduates. Financial readiness also emerged as a key factor in decisions around motherhood. Both first-year and final-year students acknowledged the importance of financial stability before starting a family; however, final-year students framed it as a more decisive precondition. This was reflected in the statement of a fourth-year Science undergraduate:

"I am not ready to give birth to kids to throw them away or offer them to a Buddhist monastery once we start to tackle financial issues."

(FGD Data, 2025)

First-year participants, by contrast, viewed financial readiness as a goal to be pursued rather than a barrier to motherhood.

Education, Career, and Lifestyle as Prerequisites

A considerable number of participants across Science, Management, and Arts disciplines prioritised education over starting a family. For these individuals, obtaining academic qualifications and advancing their careers were viewed as essential precursors to motherhood. Beyond education, career progression emerged as a key driver, with respondents emphasising the need to secure stable employment, achieve professional growth, and establish long-term career prospects before considering parenthood. Financial stability also played a critical role; participants in the early stages of their careers, including internships, highlighted the importance of a reliable income and the capacity to manage childcare costs. Personal freedom was similarly valued, with many expressing a desire to maintain autonomy and pursue individual interests, hobbies, and travel during their younger years. Lifestyle considerations further influenced decisions, as delaying motherhood was seen as a means of preserving a life oriented around career focus, social engagement, and ongoing self-development.

Balancing Career and Motherhood

The analysis of the relationship between field of study and confidence in balancing career and motherhood yielded notable insights. Participants responded to the question, "Do you feel confident balancing career and motherhood in the future?" with one of three options: "yes, definitely," "I am still thinking about it," and "no, not at all."

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The breakdown of responses shows that out of 100 management students, 51% answered "yes, definitely", 47% were "still thinking about it", and only 2% responded "no, not at all." For the science students, 51% answered "yes, definitely", 40% were still considering it, and 9% responded "no, not at all." Arts students showed a similar pattern, with 51% saying "yes, definitely", 47% still thinking, and 2% expressing uncertainty. The Chi-Square test for independence produced a Pearson Chi-Square value of 11.837 with four degrees of freedom and a significance level of 0.019 ($p < .05$), indicating a statistically significant relationship between field of study and confidence in balancing career and motherhood. The likelihood ratio also supported this result, with a value of 11.070 and a significance level of 0.026.

Most students, regardless of discipline, expressed either confidence or uncertainty about balancing career and motherhood. However, a notable difference emerged within the Science group, where 9% of students reported feeling unconfident - a higher proportion than in Management and Arts, where only two students in total expressed similar views. Management and Arts students showed comparable distributions, with most either confident or still contemplating their ability to balance both roles. This suggests that students in these fields tend to exhibit greater confidence in managing career and motherhood compared to their peers in Science.

Qualitative data further illuminated these patterns, particularly when viewed through the lens of academic progression. First-year students generally believed that career and motherhood could be balanced, often underestimating the potential for conflict. As one first-year Science undergraduate explained:

"Both studies and motherhood should be balanced. Because motherhood cannot be lost because of studies."

(In-depth Interview Data, 2025)

In contrast, by the final year, students had developed a more sceptical view about balancing a career and motherhood. As stated by a fourth-year science undergraduate:

"If you are going to have a nine-to-four job, then it's very hard to have a child as well."

(In-depth Interview Data, 2025)

These perceptions were further elaborated by fourth-year undergraduates during discussions about their workplace experiences, as many were engaged in internships. Students frequently cited hiring discrimination against pregnant women, the absence of paternity leave, and entrenched social expectations that mothers shoulder the majority of household responsibilities - concerns that were rarely voiced by first-year participants.

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> *In Sri Lanka, career aspirations and motherhood are often at odds. Many employers hesitate to recruit pregnant women, not seeing beyond their temporary leave to recognise their long-term potential. This reality forces many women to compromise their careers for motherhood because society has rigid gender roles. Even when both partners work, household responsibilities largely fall on women. Some choose to step away from their careers entirely, not because they lack ambition but because balancing both is overwhelming. Personally, I know I wouldn't be able to sacrifice my career and social engagement. For me, career and financial independence take precedence over embracing motherhood.*

(In-depth Interview Data, 2025)

Influence of Career Goals on Views of Motherhood

In terms of the extent of influence, a relatively small number of students reported that their career goals had a strong influence on their views of motherhood, with only 84 students across all fields indicating a strong influence. Among these, management students had the lowest number, with only 24% of students indicating a strong influence, compared to 27% each from the science and arts fields. The majority of students reported that their career goals had some influence on their views on motherhood, totalling 184 students. Management students accounted for the highest proportion in this category, with 63%, followed by science with 61% and Arts with 60%. A small number of students reported that their career goals had little influence on their views on motherhood, with only 29 students in total. The distribution here was relatively similar across all fields: 11% of the management students, 9% of science students, and 9% of arts students. Finally, only 3% of students reported that their career goals did not influence their views on motherhood, with management and science students having the fewest in this category (2 out of 100 and 3 out of 100, respectively). Arts students with a total of 4 reported no influence. The Chi-Square test results showed a Pearson Chi-Square value of 1.233 with six degrees of freedom and an asymptotic significance of 0.975, indicating no significant association between the field of study and the influence of career goals on views about motherhood. Although students from different academic disciplines expressed varied views on how career goals influence their attitudes toward motherhood, these differences were not statistically significant. Across fields, most participants acknowledged that career aspirations played at least some role in shaping their perceptions of motherhood.

These findings align with qualitative insights, where participants voiced concerns about traditional gender roles and the challenges of balancing

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career and motherhood. While disciplines such as Science and Management may foster career-oriented environments, overarching societal norms around gender and family responsibilities appear to influence students across fields in similar ways. The majority of participants in both in-depth interviews and focus group discussions emphasised that career goals significantly shaped their views on motherhood, with a few explicitly prioritising career over motherhood.

> *I think a woman's career has a strong influence on her role as a mother. I believe it's possible to balance both studies and a career at the same time. If I have a family in the future, I will continue to manage both my family and career. If I don't have a family, I will focus on my studies and career.*
>
> (In-depth Interview Data, 2025)

Prioritisation of Career Over Family

Table 03 presents crosstabulation data illustrating students' preferences across academic disciplines regarding the prioritisation of career over starting a family. The survey included 300 participants, with responses categorised as "yes" (prioritising career), "no" (not prioritising career), and "not sure."

Table 3: Prioritizing Career Over Starting a Family by Field of Study

Field of study	Would you prioritise your career over starting a family?			Total
	Yes	No	Not sure	
Management	34 (34%)	27 (27%)	39 (39%)	100
Science	39 (39%)	33 (33%)	28 (28%)	100
Arts	35 (35%)	40 (40%)	25 (25%)	100
Total	108 (36%)	100 (33.3%)	92 (30.7%)	300

Source: Survey data, 2025

The highest proportion of students prioritising their career over starting a family is observed among science students (39%), followed by arts (35%) and management (34%). Conversely, arts students show a stronger tendency to prioritise family over career, with 40% selecting "no". Management students exhibit the highest level of uncertainty (39%), followed by science (28%) and arts (25%). Across all fields of study, 30.7% of students are unsure about their stance on career versus family prioritisation, suggesting that uncertainty plays a significant role in decision-making. Overall, career prioritisation (36%) is slightly more common among the students than not prioritising career (33.3%), although the differences are minimal.

A chi-square test was conducted to examine the association between the field of study and career prioritisation decisions. The p-value (0.172) indicates that there is no statistically significant relationship between the field of study and the decision to prioritise career over family. This suggests that

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factors beyond academic discipline, such as personal values, societal expectations, or economic considerations, may have a greater influence on this decision.

While academic discipline may shape career trajectories, existing research suggests it does not have a strong direct relationship with women's prioritisation of career over family or marriage. Instead, personal values, societal expectations, and economic considerations appear to exert greater influence. For instance, Nzasi (2024) argues that gender norms and cultural expectations, rather than disciplinary affiliation, play a more decisive role in shaping women's career choices and the emphasis placed on professional advancement versus family life.

These findings align with and extend recent scholarship on fertility decision-making among young Sri Lankan women. The present study contributes original empirical evidence demonstrating that while academic discipline may influence career trajectories, it does not significantly shape motherhood intentions. Instead, as this research shows, personal values, economic precarity, and societal expectations, particularly around gender roles, play a more decisive role. This is echoed in broader consultations, such as those conducted by United Nations Population Fund (UNFPA) Sri Lanka (Adeniyi, 2025), which underscore that declining fertility is often a pragmatic response to systemic barriers, including housing insecurity, inadequate childcare infrastructure, and gendered labour expectations, rather than a rejection of motherhood itself. Ranasinghe and Mahesh (2025) add a pandemic lens, revealing how economic instability and relationship uncertainty have reshaped reproductive timelines. Taken together, these studies affirm that young women's attitudes toward career and motherhood are not merely individual preferences but reflections of structural constraints and evolving life goals.

Discussion

The implications of this study are multifaceted, revealing discipline-related variations in young Sri Lankan female undergraduates' attitudes toward motherhood, career aspirations, and life goals within the context of declining fertility. While motherhood remains a major life goal for most respondents, its perceived importance is negotiated alongside the pursuit of higher education, career success, economic independence, and personal autonomy. This simultaneous prioritisation reflects existing research suggesting that women's reproductive decisions are increasingly shaped by competing demands between professional and familial spheres (Blair-Loy, 2003; Gerson, 1985; Hays, 1996).

Statistical analysis indicates that Arts and Management students are more likely to view motherhood as "very important" compared to Science

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students, whose responses were more varied. This pattern may reflect disciplinary socialisation, particularly in science-related fields where extended training and delayed entry into stable employment often postpone family formation. Similar trends have been observed in Western contexts, where STEM professionals delay childbearing due to intensive career demands (Ceci et al., 2014).

Self-efficacy in balancing career and motherhood also varied by discipline, with Science students reporting lower levels than their peers in Arts and Management. This aligns with research on work–family conflict, which highlights how demanding career fields can diminish perceived feasibility of combining professional and maternal roles (Hochschild, 1989; Stone, 2007). However, qualitative data reveal that across all disciplines, traditional gender norms continue to exert a strong influence on reproductive choices. Notably, while career ambition shaped attitudes toward motherhood, the influence of academic discipline was not statistically significant. This suggests that broader structural and cultural forces, such as gendered labour market dynamics, economic insecurity, and entrenched family expectations, may be more influential than disciplinary affiliation in shaping reproductive intentions. McDonald (2000) similarly argues that gender equality in both public and private spheres is essential for sustaining fertility in advanced stages of demographic transition.

A noteworthy finding is the high level of uncertainty among students regarding whether to prioritise career or family. This ambivalence reflects a transitional cultural moment in Sri Lanka, where modern aspirations for self-fulfilment and economic independence coexist with enduring expectations of early marriage and motherhood (Gunathilake, 2023; Kodagoda & Duncan, 2010). Such indecision may contribute to deferred fertility, helping explain the country's ongoing below-replacement fertility rate (World Bank, 2022).

Demographically, the attitudinal shifts observed among educated young women could have significant implications for Sri Lanka's fertility trajectory. The sequencing of education, occupational security, and independence before childbearing mirrors patterns seen in countries that have reached advanced stages of demographic transition (Dyson, 2010). If these attitudes persist without supportive policy interventions, such as workplace flexibility, affordable childcare, and more equitable domestic arrangements, Sri Lanka may face continued fertility decline, with socioeconomic consequences including population aging, workforce contraction, and rising dependency ratios.

Ultimately, this study contributes to the limited literature on fertility intentions among university students in Sri Lanka, with particular attention to the intersections of education, career, and gender in shaping conceptualisations of motherhood. The findings underscore the need for policy

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responses that align women's reproductive ambitions with their professional and personal aspirations, fostering a more integrated and sustainable demographic future.

Conclusion

In conclusion, this study reveals disciplinary differences in how young Sri Lankan female undergraduates perceive motherhood in relation to career aspirations. These perceptions evolve over time, with final-year students expressing greater scepticism about balancing professional and maternal roles, shaped by academic exposure, peer networks, and workplace experiences.

Across disciplines, a consistent tendency to delay motherhood emerges, driven by anticipated role conflict and the prioritisation of financial stability. From a sociological perspective, reproductive decision-making is embedded within broader social structures. The data suggest that rising financial insecurity contributes to deferred family formation, reflecting a structural-blame narrative in which motherhood is viewed as both economically and socially demanding.

To address Sri Lanka's declining fertility rate, policy reform is essential. Participant discourse highlights the need for employment policies that empower women across disciplines, including flexible work arrangements, expanded paternity leave, and support for work–family balance. Financial mechanisms, such as scholarships, mentorship programs, and career development initiatives, are also critical.

Universities should strengthen gender focal points by maintaining updated databases on married graduates' career trajectories, informing curriculum and scholarship design. Improved access to affordable childcare and targeted subsidies for working parents would further support reproductive decision-making.

Finally, shifting sociocultural norms through community dialogue and the visibility of successful role models can foster more supportive attitudes toward women's reproductive choices. Enhancing maternal healthcare and expanding mental health support are equally vital. Implementing these recommendations will enable young women to pursue educational and career goals while making informed decisions about motherhood, contributing to a more equitable and sustainable demographic future for Sri Lanka.

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Data Availability: All data are included in the content of the paper.

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Declaration for Human Participants: Ethical approval was obtained from the University of Colombo Ethics Review Committee and the principles of the Helsinki Declaration were followed.

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EU market in Sight, Russian at the Gate: Three Decades of Aspiration and Resistance

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Abstract

Since 1991, Georgia has followed a difficult yet ambitious path. The declaration of independence and the pursuit of a Euro-Atlantic future placed the country before numerous formidable challenges: Russian occupation, economic collapse, hybrid warfare, painful transitions of ruling power, and deep political polarization. Despite these obstacles, Georgia emerged as a leading Eastern Partnership country, implemented notable digital and infrastructure reforms, and secured EU candidacy in 2023. This parallel dual process reflects both the nation's steadfast commitment to its European choice and the persistent efforts to break its resilience from the North.

Georgia's progress, achieved amid external sabotage, faced renewed destabilisation after its inclusion in the EU enlargement package. What war could not accomplish, Russia pursued through media influence, capital inflows, market manipulation, and exploitation of Georgia's unresolved vulnerabilities, ultimately reorienting its economy. The failure of the DCFTA further weakened Georgia's European trajectory, while Russian immigration and asset flows reshaped its political landscape.

This article questions whether the EU acted too late in opening broader access to the internal market for Georgia. In parallel with political processes, could earlier and more intensive market integration have ensured stability, economic convergence, and social well-being? Instead of a fragmented model, could this have fostered a synchronised process of political, economic, and social Europeanization? Does Georgia's trajectory reflect not only a national setback, but also a broader failure of the EU's influence in the region?

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Methodologically, the article employs analytical-descriptive and historical-assessment approaches, drawing upon both primary and secondary sources, including EU documents, International agreements, resolutions of international organizations, official reports, Georgian legal acts, historic documents, scholarly articles, statistical data, as well as media/journalistic sources. This combination serves to construct a comprehensive account of Georgia's European integration dynamics from independence to the present.

Keywords: Georgia, Middle Corridor, EU, Russia, EU Internal Market, Euro-Atlantic Integration

Introduction

Georgia is a paradoxical example of parallel dualistic processes and polarizations: it recognizes European integration as the cornerstone of both foreign and domestic policy, yet resists the process of legal approximation to EU law and standards (a characteristic feature before 2014); it carries out an intensive process of legal approximation (after 2014) while simultaneously undermining diplomatic relations with the EU (from 2022); it experiences economic growth while the number of socially vulnerable people and emigration in search of employment continue to rise; it aspires to economic independence but implements opaque privatization processes or permits the influx of unhealthy foreign investments into the country; it declares education a priority and successfully participates in the Erasmus+ programs, yet reading comprehension and critical thinking continue to decline; it fears the loss of the Georgian language, and yet, to this day, a significant number of ethnic minorities holding Georgian citizenship (many of whom have lived in the country for generations) either cannot speak Georgian, continuing instead to use Russian (This linguistic reality perpetuates enduring ties with Russia); it expresses a desire for freedom, equality, and the rule of law, while infringing on the rights of sexual minorities; it adopts market competition legislation while worsening consumer economic interests; it has pursued European integration for three decades, yet European standards have not penetrated everyday life or ensured decent working conditions; it legally guarantees personal freedom, yet banking policies erode its foundations - private property and income; it seeks EU membership while accusing the Union of dragging the country into war and undermining traditional family values.

This bipolarity can be attributed to the asynchronous and unbalanced progression of Europeanisation and democratisation processes, which unfolded across political, economic, and social dimensions in a manner that often generated mutual disruptions rather than reinforcing one another.

Since declaring independence in 1991, Georgia has embarked on an extremely turbulent but ambitious path. The declaration of independence, the

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struggle for a Euro-Atlantic future, and the historical and cultural will for freedom placed Georgia before numerous formidable challenges: the occupation of Georgian territories by Russia Federation, the emergence of separatist regimes, the crime (largely imported from Russia), a dubious and mismanaged privatization process, predatory banking policies, political polarization, social hardship, the collapse of core industrial and energy projects, mass emigration flows, and hybrid warfare.

On the other hand, over the course of three decades, Georgia demonstrated steady progress. It became a beneficiary of the European Neighborhood Policy (ENP) and a leading country in the Eastern Partnership (EaP); a key player in the Black Sea region - not only a recipient of security but also a contributor to it; a secure host country for refugees; an implementer of regional and international infrastructure and connectivity projects; a participant in the Silk Road initiative; a recipient of the Schengen visa-free regime; a country granted EU candidate status; an innovator of unique models for smart business establishment and the one-window-principle in public services; a pioneer of digital governance and e-customs; and a driver of ambitious energy diversification projects (notably the Baku-Tbilisi-Turkey corridor).

The above-mentioned is a testament to the Georgian nation's willpower and its unwavering aspiration to return to its historical European roots. However, after 2022, particularly, following December 2023, when Georgia's inclusion in the EU's new enlargement framework (*"Copenhagen +1")* solidified its European future and marked the beginning of a new geopolitical role for this small Black Sea country (even positioning it as a competitor to both Russia and Turkey), while redefining the strong contours of its Middle Corridor mission, foreign negative forces began to act swiftly in new and multifaceted ways.

What could not be achieved through war or other coercive instruments of influence was instead accomplished through media channels and increased income flows from Russia and its allied states. At this juncture, it became visibly and transparently clear that three decades of development and state transformation had not fundamentally altered the core business behaviour models. The Georgian market rapidly reverted to a Russian orientation and embraced the "taste of money."

In parallel, the Deep and Comprehensive Free Trade Area (DCFTA) agreement between Georgia and the EU proved vulnerable. From 2014 to 2023, it failed to achieve a degree of market integration and EU market openness that would firmly anchor Georgian business within a pro-European outlook. Meanwhile, the massive influx of Russian emigrants and capital into Georgia directly influenced its political processes.

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Why and how was Russia able to penetrate the Georgian market so swiftly and quickly - not only politically, but economically as well? What triggered the polarization of Georgia between the European Union and Russia? While much emphasis is placed on political/governmental shortcomings (as most analyses tend to do), the critical dimension lies in understanding the everyday reality and condition of the people/business. Politics cannot be divorced from the people. It was, after all, the Georgian people who accepted the influx of Russian capital, which in effect led to a partial replacement of European economic presence.

This article critically explores questions (supported by facts and statistics) that are often overlooked or left in the shadows (rarely voiced openly). The problems facing Georgia today must be examined from all angles; otherwise, one is left with the troubling impression that Russia knows Georgia better and is therefore more successful in achieving its objectives than the European Union.

This article legitimately poses the following paradigm: has the EU arrived too late in Georgia, or has it failed to truly understand the country in depth?

Methodologically, the article employs analytical-descriptive and historical-assessment approaches, drawing upon both primary and secondary sources, including EU documents, International agreements, resolutions of international organizations, official reports, Georgian legal acts, historic documents, scholarly articles, statistical data, as well as media/journalistic sources. This combination serves to construct a comprehensive account of the dynamics of Georgia's European integration from the moment of independence to the present. It must further be emphasized that Georgia's recent history has not been objectively (in a non-polarized and non-politicized manner) documented in either scholarly or historical terms. Consequently, in some cases, it becomes necessary to refer to sources which, by their nature, are not strictly academic but which nonetheless serve as essential records of the facts and developments of specific periods (However, the percentage of such sources does not exceed **17.23%**.).

The selection of sources was based on the following **objective criteria**: 1. **Chronological distribution** is employed. The distribution of sources is consistent and logically diversified according to the respective years. The article traces the full trajectory of Georgia's European integration process, encompassing both its positive and negative paradigms across different stages. Referencing sources by their year of publication (documented attitudes) is therefore of critical importance, as it safeguards against interpreting the phenomena under investigation solely through the prism of contemporary reflection, be it political, academic, legal, or historical. Rather, the analysis is grounded in documents and perspectives that reflect the specific

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influences, constraints, and contexts prevailing at the time of their production. 2. The sources were selected based on their credibility and recognition. Each source employed in the article is beyond dispute and possesses an official character, being cited, utilized, read, and analyzed both within the academic/scientific community and by the political class alike. 3. The sources were selected based on both their levels of influence and their originating actors, specifically encompassing the perspectives of the international, regional and national levels, the non-governmental (third) sector, as well as those of experts and academia. 4. The sources were selected according to thematic categories, encompassing normative, legal, historical, political, comparative, scholarly, and factual sources.

Legacy of Resistance: Decades Marked by Georgia's Resilience, Patience, and Endurance

No external actor has ever supported Georgia for as long and as substantially as the European Union. In fact, there is no sector or field in Georgia that has remained untouched by EU assistance, be it financial, technical, intellectual, educational, programmatic, or humanitarian. Naturally, this is a policy of mutual interest. The European Union seeks peace, justice, and freedom in its neighbourhood, as well as the advancement of its geopolitical interests through a democratic order that enables *economic connectivity, energy and trade diversification, and regional security*. Georgia, in turn, aspires to free itself from the influence of Russia and other external powers and seeks *freedom, security, and independence*. On the one hand, the European Union has made substantial investments and efforts; on the other hand, Georgia's struggle, hard work, and resilience have been equally immeasurable. Georgia's ambitions as a small state, along with its value-driven aspiration to assume a role as a central corridor and to "sit at the table" as an equal alongside larger powers, were met with positive assessments and support from the European Union. Both extended mutual trust toward one another. However, beyond the interests of the official political parties of Georgia and the EU, as well as the broader global dynamics at play, it is essential that these processes be understood by the people themselves. In Georgia, the profound polarization that characterizes Georgia currently demonstrates and confirms the fact that the benefits of thirty years of European integration ,together with the very nature, essence, concrete actions, and outcomes of the EU's continuous assistance, have not been conveyed to the Georgian population in a sufficiently sound and well-argued manner. This failure has resulted not only in political polarization, but also in a division of society into those committed to the EU and those who gaze conformistically toward Russia. The contours of European integration have, for the most part,

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remained confined within the informational sphere of political groups rather than becoming embedded in the collective civic consciousness.

Today, Georgia-EU relations are unfolding in a radically altered environment characterised by overt public criticism, suspended financial and technical assistance, a stalled negotiation process, mutual estrangement, and reciprocal accusations. It is evident that the conduct of both sides ultimately serves to strengthen Russia's interests. But why? Perhaps Georgia lacked the prudence required being a state under constant threat from Russia, including the risk of renewed military aggression, and facing ongoing territorial fragmentation. However, what about the European Union's rationality, its historically tested capacity for inclusiveness (rather than exclusiveness), and its tradition of strategic foresight and pragmatism? After all, the European Union faces similar challenges related to democracy and Russian influence in other enlargement countries as well (e.g., Serbia). Moreover, without the constant adoption of critical resolutions or without public persistent critique, the European Union cooperates with strategic patience with Turkey (despite of the fact that accession negotiations being officially suspended and it is the participant of the 3+3 format (Civil Georgia. 2023) and with Azerbaijan (a EaP country which, blamed the EU in double standard policy and has a problem of political prisoners, elections, democracy, (Alieva L. 2015) [AFET. 2017) etc. and as well as is the participant of 3+3 format). Why, then, is the public confrontation between the EU and Georgia so exceptionally severe? Is this the result of lobbying-driven politics, media and technological manipulation, or the work of an invisible hand pursuing far-reaching strategic objectives? Let's delve into layers that are traditionally left unspoken or deliberately overlooked, and examine some chronological dynamics that may, in fact, reveal better Georgia's resilience, endurance, willpower, and patience.

In the 1990s, when the Russian Federation, through formal and informal groups (composed of Russians, Abkhazians, Chechens (McGregor A. 2007) and Armenians (Arveladze B. Mibchuani T. 2009) waged war and perpetrated ethnically motivated killings of Georgians, thereby depriving Georgia of a significant portion of its Black Sea coastline and a key railway junction, the European Union, in its Copenhagen document (European Council, 1993), nonetheless referred to the Russian Federation as an important actor in European security (Kardava E. 2024). Furthermore, it took Georgia years to demonstrate that the conflict was not a Georgian-Abkhaz war (not an ethnic conflict), but rather a war between Russia and Georgia. However, it also took considerable time for the United Nations and other international organizations to acknowledge this. Even then, international official actors did not ultimately dare to adopt the terminology of "Russia-Georgia war", but the term "*Georgian-Abkhaz conflict"* was replaced with more neutral wording such as "*conflict in Abkhazia, Georgia*." Only after 2008 was the international

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community able to say "*occupation*" and "*Russia-Georgia war.*" (EaP resolution, 2008) (CoE PA resolution, 2009) (EaP resolution, 2018).

Since the 1990s, Georgia has continuously endeavoured to demonstrate its aspiration for freedom, development, and European integration. At no point Georgian people did the reconsider this orientation. On the contrary, Georgian people courageously withstood all forms of criminal infiltration (especially those exported from Russia), bombings by the Russian Federation, provocations that triggered internal national confrontations, as well as negative developments both within and beyond governmental structures (in public sector, in business sector, in NGO sector) - without ever abandoning the European path. After every fall and every war, Georgia rose from its knees and use to call again upon governments to implement pro-European reforms (which can be divided into three dynamic phases: 1999–2003, 2004–2014, and 2014–2022); It has stood out within the framework of the Eastern Partnership, resisting Russian pressure in numerous instances (e.g., signing the Association Agreement with the EU while Armenia succumbed to Russian pressure and joined the Eurasian Union). It has persistently demanded timely NATO accession, an accelerated granting of a European perspective, enhanced security guarantees, and more intensive opening of the DCFTA.

Each of the deliberately orchestrated shocks was aimed precisely at derailing Georgia from its European course. it was nonetheless overcome - whether rightly or wrongly [forms or processes]: The country's aim at energy diversification and its participation in the Baku-Tbilisi-Turkey transit corridor were met with an assassination attempt on the Georgian President In February 1998;[1] When Georgia sought to reduce its dependence on Russia by constructing regionally and internationally significant oil and gas pipelines, with support from the European Union and the United States, internal (national) protests emerged opposing the routes of these pipelines (focusing on Environmental policy). Notably, Russia directly opposed the construction of these transit corridors, while some of the internal protest movements received backing from foreign actors. Despite this resistance, the pipelines were successfully built in the 1990s, but In subsequent years, similar scenarios reoccurred in Georgia, particularly again in the energy sector, where large-scale hydropower projects such as the *Khudoni HPP* and the *Namakhvani HPP* (Razmadze M. 2024) faced intense public opposition and ultimately

[1] The Baku-Tbilisi-Ceyhan (BTC) pipeline, designed to transport Azerbaijani oil through Georgia to Turkey, was a strategic alternative to Russian-controlled energy routes. First proposed in the mid 1990s, serious discussions culminated in 1998, the year of the Shevardnadze assassination attempt. In October-November 1998, the presidents of Azerbaijan, Georgia, Turkey, Kazakhstan, and the U.S. (Bill Clinton) met during the OSCE summit in Istanbul and formally endorsed the BTC route.

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failed to materialize (so, still Georgian remains dependent on others, Russia is happy, Georgia is burdened with debt; yet to this day, there has been no transparent public disclosure regarding the sources of funding behind the continuous waves of protest, the unceasing flow of media, information, and propaganda, or the financial channels through which the NGO/civil sector operated); The launch of a new, pro-Euro-Atlantic state-building process in 2004 was followed by armed escalations in the Tskhinvali region of Georgia;[2] in 2008, when it was explicitly declared that Georgia [and Ukraine] would become a NATO member (Bucharest Declaration. 2008), the 2008 August war ensued. When Russia was claiming that Georgia had started the war, while Georgia was confirming that Russia initiated and carried out military, provocative, and offensive activities in the territory of Georgia and that Georgia had entered into a defensive mode, exactly at that time, the Tagliavini report from Europe [EU] accused Georgia of starting the military operation and of using disproportionate force ("*disproportionate force in artillery assaults on South Ossetia and in some cases used disproportionate force in their ground assault"... "Late in the evening of August 7, Georgian forces initiated massive shelling of Tskhinvali and surrounding villages in an attack that is widely considered the start of the war*"...); (IIFFMCG. 2009). Moreover, Georgia was compelled to sign a six-point agreement (Peace Plan. 2008), lobbied from European capitals, which was not in Georgia's favour ("*Georgian forces must withdraw to their usual barracks"; "Russian forces must withdraw to positions they held prior to the outbreak of hostilities"*). This agreement stipulated that Russia should return to positions held prior to August 2008, effectively "legitimizing" Russia's presence in territories of Georgia occupied since the 1990s.

The year 2008 was a turning point and pivotal for Georgian people - a moment that resulted in territorial gains for Russia and to which the international response remained inadequate. Georgia stood entirely alone against Russia. While substantial financial aid was provided from the EU and the international community, militarily it received no support. Unlike in previous wars, Georgia was, for the first time, assigned blame by the international community. The accumulation of such contradictions has

[2] Starting in June 2004, Georgian authorities began increasing their law enforcement and special forces in the areas around the Tskhinvali region. This move was partly aimed at disrupting illegal trade and smuggling, which had flourished under the protection of Russian peacekeepers and local separatists. Russia accused Georgia of escalating the situation, while Georgia claimed Russia was backing and arming the separatists. Russia reinforced its presence under the guise of the CIS peacekeeping mission, and Moscow overtly supported the South Ossetian de facto authorities. A fragile ceasefire was brokered in August 2004, with international actors (notably the OSCE) involved. No significant political resolution followed. Instead, the 2004 conflict froze the situation. Russia's military, political, and financial support to South Ossetia increased dramatically in the following years, deepening the separation.

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provoked heterogeneous reactions and triggered partially critical inquiries and expressions directed at NATO, the USA and the EU. Russia masterfully exploited this moment in its hybrid disinformation warfare. From that point onward, a latent or explicit sense of grievance, anger, and somehow a consciousness or subconsciousness of self-blame became embedded within the Georgian public. This psychological and reputational pressure later served as fertile ground for disinformation campaigns which blurred the lines between *war and peace* and led to severe political polarization currently.

The government (Georgian Dream) that came to power in the name of justice and peace - one that to this day prosecutes the former ruling party United National Movement (Fact-finding commission of the Parliament of Georgia, 2025) and blames it for starting the war (a claim partially echoed in the *Tagliavini* Report) - met Russia's 2022 invasion of Ukraine with silence and restraint. Unambiguously, it chose a path of refraining from condemning Russia and remaining "loyal" to its own political slogans and narratives. At the same time, it carefully monitored public sentiment and, recognizing society's deep fear of renewed war, effectively transformed *dignity and peace* into the cornerstone of its electoral appeal. Indeed, a significant portion of the population supported this position.

And now, these very people find itself exhausted, with inadequate and insufficient income, reliant on East Asian "investments", and surrounded by huge Russian migration flows and jobs connected to the Russian market and/or Russian capital. (IDFI. 2023)[3] And in such circumstances, where is the European capital, European standard of living? Where is the EU market that was meant to connect with Georgia's market, businesses, and people strengthening them and leading the country toward a dignified standard of existence?

Where is the EU in Georgia now? In Georgia today, EU is in criticism (which is of course directed towards the government), but half of Georgia perceives it as its own criticism, even those who sincerely want to be in the EU, because they cannot accept the fact that the EU "supports" Saakashvili

[3] "The trend of entry of Russian citizens into Georgia has been increasing against the backdrop of the war in Ukraine. Over the past three years, based on first-quarter data, the highest number of border crossings from Russia into Georgia was recorded in 2023. In 2022, 62,304 individuals from the Russian Federation were registered as immigrants in Georgia, which is six times higher than the corresponding figure for 2021. In 2022, the number of real estate purchases by Russian citizens in Georgia increased. By September 2022, Russian citizens had purchased 15,164 buildings/structures (including 13,262 apartments) and 13,850 land plots in Georgia. According to 2022 data, over 11,000 businesses of Russian origin were registered in Georgia. Surveys reveal a negative attitude among Georgian citizens toward the influx and economic activity of Russian nationals. Research indicates a desire among Russian citizens to establish a Russian community in Georgia, which against the backdrop of prevailing negative sentiments may pose a challenge to public peace".

(via resolutions and other means) and cannot accept the return of the political force that was "removed" in 2012.) In such a situation, it is already easy to build any other disinformation (like NGOs are financed from the EU, which lobby against EU membership;[4] EU forces Georgia to legalize same-sex marriage etc.). The Georgian public is now deeply polarized and the EU must reconsider the Georgian situation more comprehensively. It is also necessary to consider the bitter reality that, due to the persistent emphasis on the past and the enduring support for Saakashvili, a segment of the Georgian electorate votes for the current political leadership precisely within this paradigm. When this situation is assessed more broadly, it effectively constitutes a precondition for the victory of Georgian Dream: the focus on the past, which sets the agenda for a largely unpopular opposition that is neither unified nor cohesive, engages in internal conflicts, and is, to some extent, associated with the United National Movement. Consequently, there is a widespread perception among the public that no third force has emerged capable of overcoming this polarization and thus attracting votes. Equally, a precondition for Georgian Dream's victory is the voice of the EU, its documents (European Parliament Resolution, 2025) which are themselves heavily imbued with references to Georgia's past and support for Saakashvili (despite the fact that during that past period there were also restrictions on media freedom, issues within the judiciary, aggressive actions and the arrest of political activists, violations of human rights and the war). Moreover, all of this is articulated in the polarized media and at the same time, under conditions of restricted media freedom, quite in a manner that creates the impression that the EU supports a specific political party (the United National Movement). This process continues uninterruptedly, thereby serving to advance Russia's interests.

If indeed the people were the driving force, the ones who held every government accountable and prevented deviation from the European path, now - under conditions akin to an "anaconda-like" economic suffocation, social hardship, unworthy labor conditions, and despair over the absence of tangible improvements in well-being, the Georgian population has begun to emigrate (Russian and Asians are coming). European prosperity never materialized for the majority of citizens after decades of struggle. Consequently, the nation's resilience has declined. Georgia has not yet recovered from the trauma of the 2008 war. Moreover, there is definitely a strong dualism and two parallel worlds at play in Georgia; two distinct societies still coexist: one consists of a pro-European, while the other is composed of a Soviet-minded, pro-Russian, or predominantly Russian-

[4] Some facts of such NGOs or civil experts expressing that Georgia does not deserve the candidacy because of the government, were really revealed. But such cases have been rare, while the entire NGO sector has been unjustly placed under the disinformation spotlight as a result.

speaking community. In Georgia, there are quite a few people who have never experienced the benefits of visa liberalisation at all due to the severe economic situation and social polarization, in contexts where Georgia is turning to high-income country (Georgia Today, 2024) but parallel reality is the poverty, as over the past ten years, the number of recipients of social assistance has increased by 62.29% (Social Justice Center, 2023). As a result, many do not even know what the nation is losing. Why did they not experience it? Social hardship and poverty, especially in the regions and rural areas, have deprived people of the opportunity to travel. It was precisely during this period that Russian capital entered the country, extending its influence not only over major cities but across Georgia more broadly.

The EU today fails to fully grasp the condition, the inner sentiments, and most importantly, the regional context in which Russia is ideologically, politically, and economically dominant and victorious. It can now be boldly stated: is this not a defeat for the European Union in the region? Is this solely the burden of the Georgian people? Should the EU so easily relinquish Georgia?

Market and Survival

The practical implementation of the DCFTA and rapid and flexible opening of the EU internal market for Georgian businesses (to merge and link markets and establish a customs union) would have been a great relief. The Georgian government adopted more than 300 legal acts to implement the DCFTA obligations from 2014 (after signing the AA/DCFTA). However, Georgian producers did not feel the benefit of this opportunity and turned instead toward markets where trade, sales, and the establishment of business ties were realized more quickly and easily. This shift was significantly facilitated by the conclusion of the Free Trade Agreement with China in 2018 (MESD Georgia) and recently by the Russian economic “invasion”. If at first Georgia's share of foreign trade directed toward the EU rose to 30 percent (2014–2017), from 2018 it began to decline, reaching 20.9%". (European Commission. 2017) (European Commission. 2023) (see figure 1 and figure 2 of the current state of trade (import and export), which is the public source of the National Statistic Office of Georgia).

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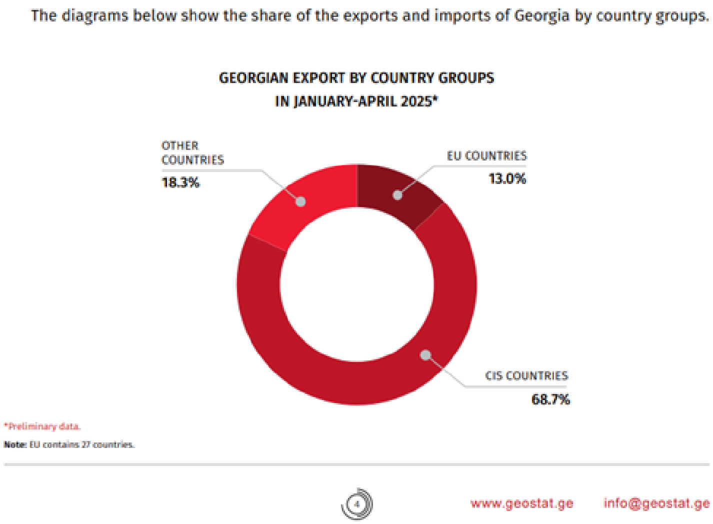
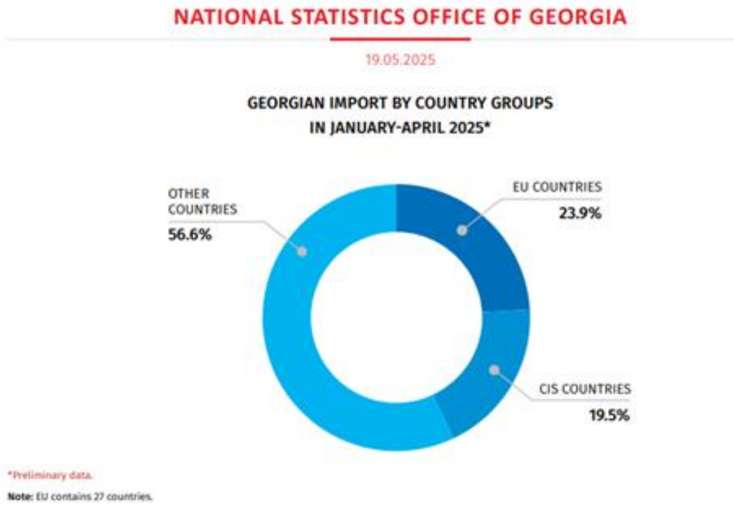
Figure 1:



[GeoSTAT. 2025.]

Figure 2.



[GeoSTAT. 2025]

In 2023 and 2024, within the framework of the EU Enlargement Package, the European Union (European Commission) assessed all ten enlargement countries. The assessment was conducted according to the following structure: Fundamentals of accession (2 chapters) and 33 sectoral chapters grouped within 6 clusters. (EU Enlargement. 2024) (EU Enlargement. 2023). The narrative-based scoring indicators for the assessments of all ten countries are as follows (Kardava E. 2025):

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"Overall score scale (summing all clusters and chapters):

- *Montenegro (76–78.5)*
- *Serbia (74.5–76.5)*
- *North Macedonia (74–76)*
- *Türkiye (71.5–71.5)*
- *Albania (63–65.5)*
- *Ukraine (43.5–45)*
- *Georgia (42–42)*
- *Moldova (32.5–35.5)*
- *Kosovo (32–33.5)*
- *Bosnia and Herzegovina (22.5–24)".*

If examine the assessments of individual countries solely according to chapters in relation to trade, market functioning, and economic-related issues, Georgia, in some cases, demonstrates a comparatively competitive, equal or in some cases even more advanced standing than other countries (Kardava E. 2025). Georgia's lowest scores are primarily observed in areas related to alignment with the EU's Common Foreign and Security Policy, democracy, and political criteria. However, these challenges are also evident, to varying degrees, in the context of several other countries. (The current situation suspended negotiations on EU accession and the stagnation of progress from Georgia following the October 2024 parliamentary elections will, undoubtedly, further aggravate the country's assessment in this area).

Why did the progress achieved between 2014 and 2023, prior to the suspension of negotiations, fail to evolve into a tangible integration of markets and a significant intensification of trade relations? The responsibility to answer this question should primarily lie with the Georgian authorities. However, it is not solely Georgia's burden; it also represents a paradigm that requires examination and accountability from the EU's side.

Although the DCFTA envisioned greater access to the EU market for Georgian producers and enterprises, the actual implementation process proved challenging. Georgian exporters encountered significant hurdles stemming from intricate technical regulations, strict sanitary and phytosanitary requirements, and the financial burden of compliance. Consequently, for Georgian businesses, the European Union has remained more a symbol of prolonged compliance with technical standards than a space of greater access to and facilitation within the EU internal market (Climate Report Georgia. 2024) while Georgia has aligned with many EU standards, its businesses have struggled to penetrate the EU market meaningfully. Georgian exports to the EU remain limited, concentrated in a few raw materials or low-value-added goods. EU investment in Georgia remains disproportionately small compared to that of Russia, China, Turkey, and Gulf countries. Trade facilitation was not followed by sufficient trade capacity development or large-scale investment

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in production infrastructure. In short, the EU market was "in sight," but not in reach.

Typically, such vulnerability or reluctance of businesses to transition to European standards is rooted in a set of complex challenges. Georgia lacks a stable industrial economy and is largely dependent on small and medium-sized enterprises. Under conditions of wars and within the global financial crisis environment, structural upgrading becomes particularly difficult. This is further exacerbated by Georgia's de facto predatory banking credit system, a political landscape heavily influenced by business interests, and, at the same time, the burden of European standards imposed on businesses particularly in the social and environmental domains. Privatization plays a significant role in this context. It raises critical questions about whose hands public assets have ended up in, and whether business activities are being conducted in alignment with Georgia's national interests. (For example, the transfer of airports into Turkish ownership, the issue of manganese production in Georgia, the privatization of the energy and telecommunication sectors, and similar cases all illustrate the strategic importance of examining whether key economic assets are being managed in line with Georgia's state and people's interests). As to competition policy and market freedom (including issues related to cartels, abuse of dominant position, state aid, and mergers) according to the European Commission's reports, present a concerning picture.

The economy, market, production, and trade are not merely matters of wealth generation, they constitute the capital and power that finance the national budget and provide the state with the capacity to invest more in meeting political criteria and advancing democratization. A nation burdened with external debts, characterized by unstable (and at times dubious) business practices, and influenced by investments driven by Northeastern geopolitical interests, faces significant obstacles on its path toward European integration. If the market does not orient itself toward Europe, the nation as a whole will struggle to move in that direction.

This is why it has been, and continues to be, fundamentally important for both the national authorities and the EU to ensure motivation and flexibility in fostering deeper market interlinkages over decades.

Georgia is a Black Sea country geopolitically situated on the connectivity routes. The EU has traditionally relied on connectivity primarily through Russia and Turkey. Positioned between these two dominant powers, Georgia holds significant potential for diversification (Kardava E. 2024). The European Union has already "disengaged" from Russia; and under such circumstances, if the EU concedes Georgia (effectively leaving it to Russian influence), it becomes entirely dependent on Turkey, thus perpetuating the very problem of lack of diversification. It is essential to underscore once again that Turkey itself faces serious democratic challenges, and its accession

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negotiations with the EU are also suspended. Therefore, the question arises: why has it become so difficult to implement a policy in which Georgia would serve as a middle corridor and a vector of diversification? Indeed, Georgia's accession to the EU would not merely provoke Russian aggression; it would also position Georgia as a reliable partner for the European Union through the development of direct connectivity, transit routes, and increased regional competitiveness. Yet, given that such an ambitious strategic vision has been adopted by both Georgia and the EU, it is imperative to sustain it. This requires strong political will not only in Georgia but equally within the EU itself. Georgia has a unique strategic value for the EU, one that remains underutilized. Georgia could be a counterweight to Turkey's geopolitical assertiveness and Russia's coercive power in the Black Sea region. However, this requires a much more ambitious EU strategy.

> *"In the global connectivity competition, Georgia is a key country. In the long term Moscow wants to reestablish the South Caucasus as its sphere of influence and bring Georgia back into the Russian orbit. It wants to establish transactional platforms like 3+3 to solve regional problems with authoritarian countries without the US or the EU. In Putin's ideal world, all countries of the South Caucasus would also join institutional frameworks like the BRICS, SCO and Eurasian Economic Union, with the aim to create alternatives to U.S.-dominated global institutions"*. (Meister S. 2025).

It should be stressed that Georgia still does not participate in the 3+3 format

According to public data of the National Statistics office of Georgia, in January-February 2025, "*the share of the top ten trading partners by imports in the total imports of Georgia amounted to 75.5 percent. The top partners were the USA (USD 478.3 million), Russia (USD 344.3 million) and Türkiye (USD 337.9 million); in January-February 2025 the share of the top ten trading partners in the total external trade turnover of Georgia amounted to 71.9 percent. The top trading partners were the USA (USD 486.9 million), Russia (USD 416.2 million) and Türkiye (USD 384.3 million)*" (GeoSTAT. 2025).

Russia's strategic intentions are, in effect, being realized through the inflow of Russian capital into Georgia, sustained trade relations with Russia, and the enrichment of Georgian businesses and individuals through these ties. It is a fact that the Georgian market has once again pivoted toward the Russian market. At this decisive point, the overarching question arises: has the European Union's engagement with Georgia come belatedly?

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It is particularly noteworthy that the intensity of people-to-people contacts also strengthens business relations and fosters EU awareness politically, economically, culturally, and socially. Yet, flights from Georgia to the EU remain very expensive. The Georgian public still remembers how easily and cheaply one could travel to Moscow - a strategic move by Russia, allowing frequent and effortless access to the "center," which historically directed trade, education, and economic activity toward Moscow. Today, this factor must also be considered in the context of Georgia's European economic integration: the intensification of interpersonal connections, which can enhance Georgia's links to the EU, and facilitate Europe-oriented business, requires travel routes (flights) be simple and price-affordable. Currently, the discourse surrounding the suspension of the visa-free regime which is often accompanied by exaggerated disinformation, intensifies polarized sentiments in Georgia, creating the perception that the country is being punished and progressively distanced from the EU. This, in turn, reinforces the notion that Georgia will never get real EU membership.

Conclusion

Meaningful and sustainable progress on the political criteria, rule of law, human rights, and democratic institutions cannot be achieved without a resilient economy encompassing the state, businesses, and citizens. In Georgia's case, the lack of a robust domestic industrial base, limited access to the EU internal market, and insufficient economic integration with EU capital flows significantly undermine its political reform agenda. Moreover, in the context of the global economic struggle, Georgia had its specific role and geopolitical significance to the extent that, together with the European family, it created a secure (democratic - albeit hybrid and developing) connecting space. This reality "compelled" the East/Asia to engage with Georgia and operate within it, since for them, Georgia represented a pathway to Europe. For the European Union, on the other hand, Georgia served as a diversified connector to the East. Eliminating such a role as a connector would increase Georgia's economic dependence and further open opportunities for Russia to advance its own interests in the region, which would be detrimental to none of the global actors.

Economic stability, employment, and social justice are essential prerequisites for securing public support necessary to sustain challenging reforms. When Georgia's economy is more responsive towards Russia or China (CIS countries) than to EU internal market or EU structural funds, its trajectory toward European integration remains fragile and exposed to external vulnerabilities.

Georgia's European future cannot rest solely on political rhetoric or legal approximation. The EU must recognize that visible economic integration

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and tangible investments are essential to build resilient societies, not wait for the next 30 years. The current imbalance where everyday financial survival depends more on others than on the EU, it should come as no surprise that part of Georgia will continue to look toward the North (and East) particularly those who were already ideologically inclined in that direction and who would have needed to feel the tangible benefits of the EU market in a competitive way to appreciate the value of the new reality.

At the same time, the EU must not forgo the strategic opportunity that Georgia represents as a channel for diversification and as a competitive counterbalance to Turkey. The EU should not risk losing the investments, financial resources, and political capital it has already committed to Georgia. However, if the prevailing approach devolves into a contest of "who outmanoeuvred whom publicly" or a reaction of "how dare they criticize us," thereby squandering valuable time and opportunities, Georgia will inevitably drift fully into Russia's sphere of influence. What benefit would the European Union derive from such an outcome?

There is also a political reality that must be acknowledged: the EU should refrain from engaging in the Georgian government's political narratives centred on the constant re-examination of the past. By repeatedly referencing former President Saakashvili in its resolutions, the EU inadvertently reinforces elements of Russia's agenda and allows itself to be drawn into a geopolitical discourse shaped by Russian strategic framing. Meanwhile, significant segments of the Georgian public struggle and find it difficult to accept such an approach from the European Union. It is therefore essential for the EU to develop a more nuanced understanding of Georgia's present-day political and societal context. While the continued rule of the Georgian Dream party into a fourth term marked by political polarization, concentration of power, and democratic backsliding poses serious concerns, these should not compromise the EU's strategic pragmatism. Effective policy engagement must also take place through discreet, face-to-face ,results-oriented diplomacy, rather than relying solely on distance criticism (until the Georgian people resolve their internal challenges through elections or other democratic means).

It is of critical importance that, in the process of analyzing European integration, objective academia and researchers become more actively engaged. For a genuine and in-depth understanding of Georgia (from the EU part), including the acquisition of informational balance and a multifaceted perspective, cooperation and communication from the EU in Georgia should be strengthened and extended to reach not only the powerful (and simultaneously monopolistic) non-governmental sector but also other actors.

In a context where the parties are almost entirely unable to communicate with one another, it would be beneficial to appoint a

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spokesperson/political nagotiator who, in the eyes of the Georgian public, is not associated with any past or present political movements, and who would be regarded by both the European Union and Georgia as largely trustworthy, academically credible, and well-versed in Georgia's European integration. Using this mechanism, a document (or set of rules) could be developed outlining how cooperation could be maintained and a minimal dialogue sustained on mutually selected issues prior to democratic changes in Georgia. What is needed is an interim, moratorium-like process, involving direct (behind-closed-doors) dialogue, transitioning from a politically unfavourable media-technological environment to a space of genuine political agreements.

There is a need for strengthened, intensive non-stop informational and strategic communication, on the one hand, within Georgia regarding the European Union (including with ethnic minorities, in their languages), which should not carry the character of political confrontation but rather foster understanding of the EU. On the other hand, it is fundamentally necessary, at the regional and international levels, to preserve Georgia's reputation. The information space should not create the impression that Georgia is the region's largest subject of dictatorship (which is clearly not the case). It would be advisable to establish an EU Information Center (or revive a previously closed one) in Georgia, with regional representations. However, these recommendations can only be implemented once communication between the EU and Georgia is restored at the diplomatic and official levels. If establishing such an official structure (and its representations) proves impossible, social networks and internet media should be utilized for resilience, overcoming these difficult years, and maintaining connections between the Georgian and European communities for the future agenda through unstoppable and widely accessible informational products with broad impact. Today's media in Georgia tends to politically "divide" the European Union (touch the EU in political discourse only), rather than explain it and foster public appreciation of it every day.

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Echoes of Silence: Postcolonial Feminist Voices in Hosseini's *And The Mountains Echoed*

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Abstract

This paper examines the silenced yet resonant voices of Afghan women in Khaled Hosseini's *And the Mountains Echoed* (2013) through the lens of postcolonial feminist theory. Methodologically, the study employs a qualitative textual analysis, conducting a close reading of the novel's multi-generational narrative. The analysis is systematically guided by a theoretical framework of C. T. Mohanty, G. C. Spivak, and D. Kandiyoti to interrogate how gendered silence is inscribed, resisted, and reimagined within the novel's multinational and multigenerational frameworks. Drawing on their works, the study explores the interplay between patriarchal structures, cultural memory, and geopolitical displacement. It argues that Hosseini's portrayal of female characters somehow creates a textured tapestry of various levels of resistance - from silent endurance to rebellious action, and deferred agency, thereby challenging dominant monolithic representations of Afghan womanhood. This study contributes a nuanced framework for reading Afghan female subjectivity as a site of both reassurance and agency. It offers a postcolonial feminist methodology for analysing literary representations that resist reductive victimhood and accentuate complex, situated forms of resistance.

Keywords: Postcolonial feminism, Afghan women, diaspora and displacement, resistance, and multinational and generational narrative

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Introduction

In Khaled Hosseini's *And the Mountains Echoed*, silence reverberates not as absence but as a potent narrative force, shaping memory, identity, and agency. Afghan women in the novel often occupy liminal spaces where they are spoken about rather than speaking for themselves; they are present nevertheless, peripheral. This article explores how postcolonial feminist theory can illuminate the subtle, often muted voices of Afghan women in Hosseini's novel, revealing ideological tensions among representation, erasure, and resistance.

The significance of this study lies in its interrogation of literary silence as a gendered and political construct. Drawing on the works of G. C. Spivak, C. T. Mohanty, and D. Kandiyoti, the paper foregrounds how Afghan women's subjectivities are shaped by intersecting forces of patriarchy, displacement, and global spectatorship. Thus, instead of treating silence as passivity, this research repositions it as a site of interpretive richness, where voice is not always audible but always meaningful.

Hosseini's novel has been received with considerable attention for its emotional depth and diasporic scope. Critics have praised the novel's ability to portray the complexity of familial bonds and cultural displacement through a polyphonic structure that resists linear storytelling (Sharma, 2017). Majeed and Akhtar (2020) further argue that the novel captures the perennial predicament of diasporic identity, straddling the vulnerable guideposts of home and exile, and reflecting the impossibility of return as a central emotional and thematic concern. Nevertheless, existing scholarship often centers on trauma and familial bonds, overlooking how Afghan women's narratives are mediated, fragmented, or silenced within broader cultural and geopolitical frameworks. Therefore, this article seeks to bridge the gap by analysing key female characters whose stories echo across generations and borders.

Methods

This paper employed a qualitative, interpretive methodology based on postcolonial feminist literary criticism. The primary material analysed was Khaled Hosseini's novel *And the Mountains Echoed* (2013), selected for its transnational narrative structure and its diverse depiction of Afghan women across generational, geographic, and diasporic boundaries. The research focused mainly on both female characters and male figures whose life experiences reflect broader themes of displacement, silencing, memory, and agency.

Rather than relying on statistical or quantitative methods, the research utilised close reading and thematic analysis to examine how silence, voice, and identity were constructed and contested within the novel. Four thematic

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axes guided the inquiry: gendered displacement and silencing, rebellion and contradiction, diasporic identity and fragmented memory, and sisterhood and solidarity.

To ensure theoretical rigour, the study drew extensively on the foundational works of Chandra Talpade Mohanty, Gayatri Spivak, and Deniz Kandiyoti, whose contributions to postcolonial and feminist thought shaped both the analytical lens and the interpretive framework. These thinkers provided critical scaffolding for examining the intersections of gender, power, and representation within Hosseini's transnational narrative.

Mohanty's transnational feminist critique, particularly in *Feminism Without Borders: Decolonizing Theory, Practicing Solidarity* (2003), challenges Western universalist assumptions and stresses the importance of historical and cultural specificity. Her assertion that "the discursive colonization of Third World women…produces a composite, singular 'Third World woman'" (Mohanty, 2003, p. 19) informed the study's resistance to homogenising Afghan female subjectivity. Moreover, Mohanty's emphasis on solidarity across borders - "not the universal sisterhood, but a political kinship forged through shared struggle" - was central to the thematic axis of sisterhood and solidarity, guiding the analysis of female relationships and collective agency within the novel.

Spivak's theory of patriarchal bargains, articulated in *Bargaining with Patriarchy* (1988), offered a nuanced understanding of how women navigate and negotiate power within culturally specific patriarchal systems. Kandiyoti argues that "women strategize within a set of concrete constraints," and that these bargains "exert a powerful influence on the shaping of gendered subjectivity" (1988, p. 275). This framework was instrumental in analysing the nevel's depiction of female rebellion, contradiction, and adaptive agency - particularly in contexts where resistance is not overt but embedded in relational and symbolic acts. Thus, Kandiyoti's insights helped illuminate how Afghan women in the novel engage in subtle forms of negotiation and resistance within patriarchal structures.

In addition to these core theorists, the study incorporated insights from Brickell and Speer (2020) on gender displacement, Govindaraj (2013) on female contradition and resistance, and Shameem (2021) on diasporic memory. These secondary sources not only supported the thematic scaffolding but were interpreted through the primary lens of Mohanty, Spivak, and Kandiyoti, ensuring a coherent and theoretically grounded approach.

In this respect, the fictional characters in Hosseini's novel were examined through their narrative roles, relationships, and symbolic functions. Special attention was paid to silences, narrative gaps, and indirect representations, which were treated as meaningful sites of feminist inquiry. Moreover, the researcher's own postcolonial feminist personality was also

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acknowledged throughout the paper, recognising that interpretation was shaped by cultural, academic, and ideological contexts.

This methodological approach thus enabled a layered and theoretically grounded understanding of how Afghan women's voices were constructed, mediated, and sometimes silenced within diasporic literature. The findings were synthesised thematically and interpreted within the broader framework of postcolonial feminist theory, offering a critical intervention into literary representations of Afghan women.

Results

This paper analyses Hosseini's novel to reveal a layered portrayal of Afghan women whose lives are shaped by collective forces of patriarchy, displacement, and transnational identity. The novel, from a postcolonial feminist perspective, presents female characters whose agency is often oppressed, muted, fragmented, yet resonant within broader cultural and historical contexts.

One of the most striking findings concerns the gendered nature of displacement and silencing. Characters such as Parwana and Nila embody the emotional and social consequences of forced movement and exile. Parwana's internalised guilt over separating Pari from Abdullah, as well as her decision to abandon her disabled sister Masooma, reflect how women are positioned as both victims and reluctant agents within patriarchal structures. Parwana's silence throughout the narrative is not merely an absence of voice but a manifestation of embodied trauma, reminiscent of Brickell and Speer's (2020) argument that displacement is often accompanied by emotional silencing, particularly for women. Moreover, Nila's relocation to France further complicates this theme; while she gains physical autonomy and artistic expression, she remains emotionally estranged from her daughter and homeland. Her poetry becomes a platform for expressing suppressed desires and a critique of Afghan gender norms. Yet, her voice is propagated and mediated through male characters and Western readers, raising questions about representation and authenticity (Govindaraj, 2013).

Female rebellion is portrayed in the novel as subtle, fragmented, and often contradictory. Nila's rejection of traditional motherhood, abandoning her husband Suleiman Wahdati, and embracing sexual autonomy challenge dominant narratives of Afghan femininity. However, her rebellion is complicated by her sense of emotional instability, suggesting that resistance is not always empowering and coherent. This aligns with Govindaraj's (2013) assertion that postcolonial female agency often exists in tension with internalised oppression and cultural expectation. Accordingly, the decision to forsake Masooma, framed as a moment of liberation, haunts Parwana and

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results in her silence and a constant feeling of guilt, which reveals the ethical complexities of female agency in patriarchal contexts.

The novel's transnational dimension - spanning Afghanistan, France, Greece, and the United States - reflects the fragmented nature of diasporic identity. Moreover, characters such as younger Pari and Idris grapple with inherited memories, cultural dislocation, and burdened representation. Pari's quest for her origin is mediated by letters, photographs, and second-hand stories, underscoring Shameem's (2021) claim that diasporic memory is often fractured and reconstructed through symbolic artifacts. The motif of the term "echo" in the novel's title becomes a metaphor for this fragmentation: voices reverberate across time and space but are never fully recovered or unified. In this respect, Afghan identity, particularly for women in diaspora, is portrayed as a mosaic of longing, rupture, and partial belonging.

Finally, while the novel does not depict explicit feminist solidarity among its characters, it comes across moments of empathy and connection among women. For instance, the bond between Parwana and Masooma, though fraught with resentment, reflects a complex form of sisterhood shaped by survival and duty. Similarly, the relationship between the two Pari, though separated by decades and continents, suggests a symbolic continuity of female experience. These moments appeal to Mohanty's (2003) and Hooks' (1986) calls for transnational feminist solidarity rooted in lived experience rather than abstract universalism. Thus, women's relationships in the novel - often marked by silence, emotional labour, and sacrifice - offer a counter-narrative to patriarchal fragmentation. In doing so, they foreground the potential for feminist connection across borders.

Discussion

The sale of Pari to the Wahdatis serves not only as the novel's emotional and narrative fulcrum, but also as an act of gendered displacement and silencing. This transaction initiates a cascade of incidents throughout the novel - familial and cultural ruptures that disproportionately affect female characters, particularly Pari and Nila. Their trajectories reflect what Brickell and Speer (2020) term "multi-scalar politics of (im)mobility" (p. 133), wherein displacement is not merely geographic but deeply gendered and epistemic. Pari's removal from her natal family and subsequent erasure from memory exemplify the silencing of female agency within patriarchal structures, entailing suppression of female voice, autonomy, and memory.

Although Nila relocates to Paris along with Pari and leaves behind her ill husband, the idea of offering Pari to the sterile Nila is Nabi's. His words sum up the commodification of Pari: "I thought only of the fact that I was offering her a gift that men with far greater prospects could not" (Hosseini, 2013, p. 101). Having discovered the source of Nali's unhappiness, Nabi

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knows the antidote, Pari - assuming that he and Nila can later become lovers. Thus, the idea of commodifying Pari is well calculated by Nabi, for he knows both Saboor's dire straits and Nila's void life and need for a child, not forgetting Afghan norms that are lenient toward such practices.

The moment Pari is taken by her father to hand her to the Wahdatis is heartachingly difficult. Pari shouts "Abollah! Abollah!" (Hosseini, 2013, p. 102) as Nabi whisks her away from her beloved brother Abdullah, and Nabi confesses to Markos the long-lasting weight of this event on him throughout his entire life by telling him, "I tore one from the other" (p. 102), signifying Pari and her brother.

Furthermore, the commodification of Pari begins not with her literal sale, but with Saboor's bedtime story about Baba Ayub, a poor farmer, who sacrifices his child to the div - a mythical beast - in order to save his brothers as an act of mercy. This introductory tale mirrors Saboor's own moral rationalisation of relinquishing Pari to a wealthy family as a form of deliverance from poverty and suffering. However, beneath the surface lies a haunting portrayal of how patriarchal structures sanctify the disposability of female bodies. In this vein, Ali, Hayat, Danish, and Azher (2022) argue that Hosseini's invocation of fable-like storytelling situates the novel within a cultural tradition that normalises female disempowerment under the guise of noble sacrifice.

Once Pari is settled in the Wahdatis' house, some matters need to be modified; in other words, Pari is subjected to a systematic brainwashing. She is instructed to address her step-uncle by his first name only in order to gradually erase him from her memory as a family member. Moreover, her parents, according to the deal struck between Saboor and the Wahdatis, are not allowed to see Pari anymore, a further step towards eradicating Pari from her past life. Her "new" mother, Nila, sets about teaching her French - Nila's mother tongue. Pari's initial homesickness is soon replaced by gradual adaptation to her new luxurious surroundings; "she [Pari], with each passing day, more forgetful of her past life in Shadbagh and of the people in it" (Hosseini, 2013, p. 103).

Pari's commodification is layered - she is not only exchanged between families but symbolically possessed by figures who redefine her identity for their own personal, emotional, or social needs. Though influenced by paternal agony, Saboor's decision silences Pari's voice and autonomy. Accordingly, Rudhra (2016) emphasises how Afghan women in Hosseini's fiction are often reduced to "salable commodities," instrumentalised within patriarchal dominion, rendering their personhood invisible. This objectification parallels literary precedents such as Mahasweta Devi's *Breast-Giver* (1997), where Jashoda's body is a tool of nourishment until it fails, and Perumal Murungan's

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One Part Woman (2013), where Ponnayi's body is offered to uphold her husband's honour.

Drawing on Spivak's (1988) notion of the subaltern, Pari becomes a figure spoken for by others: Saboor, Nabi, Nila, and eventually Western norms that mould her adolescence in Paris. The very act of selling Pari constitutes a symbolic colonisation of identity and potential, reducing her to a transactional object within patriarchal and economic systems that erase female agency and sever kinship bonds. Foucault's (1977) theory of biopower is pertinent at this point: Pari's body is managed, transferred, and disciplined across socio-cultural boundaries to fit varying frameworks of motherhood, femininity, and civility. Consequently, Hosseini's depiction of Pari somehow embodies a transnational commodification, where female subjectivity is shaped by the power structures of both Global South patriarchy and Global North liberalism.

In this light, Hosseini's *And the Mountains Echoed* does not merely depict a tragic separation but rather interrogates the ideological systems that commodify female bodies through economic desperation, cultural expectation, and patriarchal narration. When juxtaposed with Devi's and Murugan's texts, the novel contributes to a broader discourse on the systemic objectification of women in postcolonial literature, inviting readers to critique how female characters are often rendered tools of survival or symbols of cultural continuity rather than autonomous subjects.

Between Liberation and Collapse: Nila's Postcolonial Feminist Rebellion

Nila Wahdati's postcolonial feminist quest in *And the Mountains Echoed* unfolds as a complex negotiation between cultural rebellion, emotional fragmentation, and the pursuit of self-definition. She emerges as one of the most intellectually and emotionally provocative figures in the novel. As a woman of mixed heritage - half French and half Afghan, Nila exists in cultural liminality, challenging the rigid gender expectations of Afghan society and the romanticised ideals of Western feminism. Her mixed heritage allows her to straddle two disparate cultural backgrounds, which complicates her identity and positions her not as a bridge between two different cultures, but as a disruptive force that resists categorisation. Her refusal to conform to either Afghan domesticity or Western feminist expectations reveals the limits of both systems in accommodating fragmented, diasporic subjectivities.

Born to a French mother and an Afghan father, Nila's upbringing is steeped in cultural dissonance. With the absence of Nila's mother - as Hosseini does not provide a detailed account of her life, it is presumed that she either died or left Afghanistan when Nila was still young - and her father's stern conservative, traditional character that is a part of the Afghan patriarchal order, against which Nila would spend a significant part of her life resisting. As a result, their relationship is marked by emotional distance and ideological

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conflict; Nila's words in the novel reflect this ideological clash when she mentions in an interview that he accuses her of damaging the family's reputation beyond repair, describing the poems she has written as "the ramblings of a whore" (Hosseini, 2013, p. 211). Pari's father not only disapproves of her provocative poetry but also of her liberal behaviour in general including her extramarital affairs, drinking, and smoking. This paternal disapprobation is not just familial; it reflects the broader societal rejection of such acts that defy the normative roles of women in Afghan culture.

Suleiman Wahdati's marriage proposal arrives at a moment of profound vulnerability for Nila, who, following a critical surgical operation in Delhi, finds herself physically weakened and emotionally adrift. After the operation, Nila is aware of her infertility, and the operation symbolises both a confrontation with mortality and a rupture in her bodily autonomy, causing her disorientation and susceptibility to existential despair. In this fragile state, Suleiman's proposal becomes more than a social arrangement; it serves as an escape for Nali from her father's patriarchal authority, a lifeline extended to a woman teetering on the edge of despair. Therefore, their reunion, though marked by lovelessness and detachment, provides Nila with a semblance of structure and protection from the oppressive authority of her father. In this respect, Nabi sees Nila's marriage as "even an unhappy one, such as this - is an escape from even greater unhappiness" (Hosseini, 2013, p. 90).

Paradoxically, Nila's acceptance of Suleiman's proposal, despite her rebellious nature, can be read as a strategic retreat into traditions, a calculated move to escape the suffocating grip of patriarchal structures. By resorting to this socially sanctioned norm, Pari appears to be circumventing her father's control while simultaneously gaining access to the privileges of Kabul's elite class. Eventually, this act of apparent conformity allows her to later subvert societal expectations from within, particularly by adopting Pari, pursuing writing poetry, and eventually leaving her ill husband to the care of Nabi and fleeing to Paris.

In one of the novel's most jarring depictions of patriarchal violence, a group of men discusses Nila's alleged promiscuity and poetic defiance. Zahid recounts that Mr. Wahdati's family disapproved of the marriage due to Nila's "poor character," claiming she had "no nang and namoos, no honor," and likening her to a car that had been "ridden all over town" (Hosseini, 2013, p. 81). The men's reaction culminates in one person's response that in his village "they would have slit her throat by now," which exposes the brutal logic of honour-based violence and the cultural policing of female sexuality. This moment is emblematic of what Mohanty (2003) critiques as the construction of the "Third World woman" through reductive binaries: the honourable versus the dishonourable, the silent versus the outspoken. Furthermore, Nila's

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refusal to deny these allegations and her choice to write poetry about them becomes an act of resistance, challenging both Afghan patriarchal norms and Western tendency to romanticise rebellion without acknowledging its risks. Her poetic voice, condemned by the group of men as shameful, can be viewed as a subversive articulation of agency, i.e., what Minh-ha (2004) might call a refusal to be "spoken for" or "spoken about."

However, Nila's life in Paris does not seem up to her expectations but rather a continued path of alienation and disappointment. Her life in Paris, though initially envisioned as a space of liberation and artistic fulfilment, devolves into a prolonged experience of existential estrangement. Her bohemian lifestyle - marked by poetry, alcohol, and fleeting relationships - fails to provide her with the emotional anchoring she craves. Moreover, as she ages, her sense of dislocation intensifies, and her relationship with her adopted daughter becomes increasingly strained, marked by resentment and detachment.

Therefore, Nila's disappointment in Pari is not merely personal; it reflects her broader disillusionment with the ideals she once championed. This paradoxical rebellion - void of emotional fulfilment - is reminiscent of Trinh T. Minh-ha's (1990) contention that the pursuit of emotional identity involves a longing for an imagined, untainted essence, one that excludes hybrid or Western-influenced selves. Thus, Nila's hybrid identity - far from empowering her - becomes a source of existential dissonance, challenging the romanticised ideals of both Afghan tradition and Western feminism.

The mother-daughter tension reaches a climax when Pari reveals that she is involved with Julien, a university professor who had previously been Nila's lover. The revelation proves devastating for Nila, who responds with emotional estrangement and veiled hostility, telling Pari, "I don't know who you are, what you are capable of… You're a stranger to me" (Hosseini, 2013, p. 206). Thus, this moment encapsulates the rupture in their relationship, as Nila perceives the affair not only as a betrayal but as an eradication of her maternal authority and emotional agency.

Nila's disappointment is further articulated in her interview with *Parallaxe*, where she refers to Pari as her "punishment" (Hosseini, 2013, p. 216). This harsh categorisation underscores the depth of her disappointment, resentment, and failure of her maternal aspirations. Despite having rescued Pari from what she sees as a life of servitude and poverty, Nila finds herself alienated from the very daughter she hoped to liberate. Her suicide shortly after the interview marks the culmination of this alienation; a final act of withdrawal from a world that no longer reflects her ideals or offers her solace.

In sum, Nila represents a postcolonial feminist assertion that experiences of womanhood are deeply embedded in cultural, historical, and political contexts. Her inability to feel truly at home in either society highlights

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the emotional and existential challenges faced by women of mixed heritage in navigating spaces shaped by competing norms and expectations. Her eventual suicide at 44 - the symbolic closing act of a life lived in perpetual contradiction - stresses this failure to reconcile personal agency with emotional resilience. Ahmad and Khan (2020) frame Nila's trajectory as a critique of both Afghan patriarchy and liberal feminist frameworks. She is neither the submissive Afghan wife nor the archetypal liberated Western woman; instead, she disrupts these binaries. Nila simply refuses to be neatly categorised.

In this light, Nila's rebellion is not triumphant but rather a slow unravelling. Her character illustrates how acts of defiance, when unaccompanied by emotional support or communal understanding, may devolve into psychological distress. She stands as a testament to the complexities of hybrid identity and gendered resistance in a postcolonial context, thereby critiquing not only Afghan repression but also the inadequacies of Western feminist romanticisation.

Postcolonial Silence and the Politics of Belonging in Pari's Wahdati's Journey

Pari Wahdati's character offers a compelling site for postcolonial feminist analysis, particularly in relation to how her identity is shaped by silencing, displacement, and gendered politics of memory. The moment of Pari's separation from Abdullah - her beloved "Abollah" (Hosseini, 2013, p. 17) - is arguably the emotional fulcrum of the novel, as well as a deeply resonant site for postcolonial feminist study. It is not merely an emotionally tense moment; it is a symbolic act of silencing, commodification, and gendered dispossession.

Pari's removal is orchestrated under the guise of economic necessity. Saboor's resolution to give away Pari to the Wahdatis reflects the brutal calculus of the patriarchal scheme of survival, rendering Pari a sellable commodity that can settle down his financial problems. This act, though framed as a sacrifice, reinforces the systemic devaluation of female agency in Afghan society. The conundrum of this act is compounded by the fact that Pari is too young to comprehend her father's betrayal, yet old enough to feel the severance. Her tender attachment to her brother Abdullah, whom she calls "Abollah" (Hosseini, 2013, p. 17), renders the separation moment intimately unbearable. It is not just a sibling bond that is severed but a sanctuary of emotional safety.

From a Spivakian perspective, this moment exemplifies the subaltern's erasure. Pari's voice is not heard; her fate is decided by Saboor and Nabi, who rationalise the act through patriarchal and economic logistics. Thus, she is spoken for, not spoken to. The novel's structure, accordingly, mirrors this silencing by delaying her narrative voice until adulthood; her childhood is

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narrated through other characters, reinforcing the idea that her subjectivity has been overwritten.

Abdullah's desperate attempt to follow her, his emotional heartbreak, and his lifelong mourning for his loss serve as a counterpoint to the silence imposed on Pari. He becomes the guardian of memory, keeping the feathers Pari loves in a tin box as relics of their bond. These feathers, particularly the yellow one, become symbols of lost innocence and enduring love. His grief is not just personal; it reflects the social and emotional cost of patriarchal decisions and their effect across generations. Hepzibah (2020) argues that adoption in Pari's case cannot be considered a benevolent act but a form of "abscission of familial bonding," where the child is severed from her cultural and emotional roots. The trauma, though muted in Pari's early life, affects her life throughout the narrative in the form of identity fragmentation, emotional detachment, and a persistent sense of absence.

Pari's long-awaited reunion with her brother Abdullah unfolds not as a moment of catharsis but as a quiet elegy to memory, loss, and the irretrievability of time. Suffering from dementia, Abdullah is unable to recognise his sister despite having spent decades haunted by her absence. This cognitive decline renders the reunion tragically absurd, as his lifelong yearning culminates in a moment where recognition is no longer possible. The emotional restraint of this scene underscores the novel's broader meditation on the fragmentation of identity and the silencing of familial histories. As Spivak (1988) argues, the subaltern's voice is often lost within dominant structures; in this context, Abdullah's mental deterioration, in a way, becomes a representative of the erasure of memory and the impossibility of fully reclaiming the past. As Pari is beside him, singing their childhood lullaby, the moment becomes an act of resistance against this erasure - an attempt to rethread the severed ties of kinship through affective memory.

In this emotionally muted landscape, young Pari - Abdullah's daughter - assumes the role of narrative conduit and emotional translator. Having grown up witnessing her father's grief and longing, young Pari internalises the absence of her aunt as a missing piece of her own identity. Her decision to personally take care of her father and facilitate the reunion of her father and aunt reflects a generational attempt to resist erasure and silencing by offering her aunt the lost part she has frequently missed: her brother, her origin, and the rupture that has shaped her. Young Pari becomes the vessel through which silenced histories are acknowledged and emotionally processed. This cross-generational exchange resonates with Mohanty's (2003) critique of Western feminist frameworks that often overlook the layered complexities of familial and cultural memory. Through young Pari's emphatic mediation, Hosseini crafts a subtle feminist intervention, one that privileges emotional labour,

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intersubjective healing, and the reclamation of female agency across temporal and spatial divides.

When Feathers Become Testimonies: Abdullah's Role as Surrogate Parent

As Pari's brother and emotional anchor, Abdullah suffers the most from Pari's commodification. His lifelong grief and devotion highlight the emotional cost of patriarchal decisions, particularly as they not only affect female but also male figures - including himself - who sometimes serve as emotional anchors within fractured families.

In the opening chapters, Abdullah, after the death of their mother, assumes a nurturing and caring role for Pari. He gives her the best food, tells her their mother's lullaby, and even sacrifices his own comfort to make her happy, particularly when he trades his only pair of shoes for a feather to gift her; a gesture that reflects his kind affection and selflessness. Thus, Abdullah acts more like a tender parent than a sibling for Pari in Shadbagh.

Another important moment in which Abdullah appears as the only one who truly cares for his sister is when his father, along with his step-uncle Nabi decide to hand over Pari after selling her to the Wahdatis. Abdullah adamantly follows Pari and his father despite Saboor's orders to Abdullah not to follow them. He endures being hit hard by his father, but never gives up following Pari. Joining their company, Abdullah sleeps next to his sister and continues the journey to the Wahdatis' house, where Pari is given away in return for financial improvement. Abdullah is devastated by this separation and Pari's voice is silenced. Pari and her beloved brother must go separate ways. This rupture becomes a metaphorical silencing, where Pari's agency and voice are removed, and Abdullah's grief becomes a proxy for her loss; when all people in Shadbagh refrain from mentioning her name, Abdullah is haunted by Pari's memory.

After losing Pari, Abdullah is faithful to his sister's memory. He keeps the box of feathers that Pari likes for decades. Despite the geographical and social distancing, Abdullah remains emotionally tethered to his little Pari. In this sense, the final chapters of the novel portray Abdullah's unwavering memory of his sister Pari. The feather motif is used to reflect emotional resonance and a symbolic continuity of his love for her. The feathers, collected from various birds throughout Abdullah's life, are placed in a tin box that becomes an artifact of memory, each representing a lost moment of childhood affection he and Pari once shared. Moreover, when memory starts failing, Abdullah instinctively safeguards these relics of memory, underscoring the idea that memory and love can persist even when cognitive skills fade. This gesture somehow reinforces the theme of emotional fidelity amidst diaspora

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and displacement, which reverberates strongly through a postcolonial feminist lens as a quiet form of resistance against erasure and forgetfulness.

Moreover, Abdullah naming his daughter Pari serves as an act of reclamation, continuity, and resistance against erasure. The choice bridges the past and the present, allowing his sister's memory to live on within his domestic life in the USA. Naming, in this sense, becomes both a cultural and emotional transmission, where identity is preserved not just through storytelling but through living tribute. His daughter, little Pari, becomes an echo of the original Pari, illuminating how love can ripple through generations and geographical locations. Beyond the act of naming, Abdullah actively constructs an emotional portrait of his sister for his daughter by narrating Pari's story in vivid details: how their father Saboor sold her to the Wahdatis, how she was his only true family, and how their bond was severed by circumstances rather than by choice. Thus, old Pari becomes the twin sister of young Pari, who writes postcards for her aunt and keeps them the way her father keeps the feathers. These stories, told repeatedly by Abdullah to his daughter, create a clear image of his sister in his daughter's mind that is imbued with sorrow, longing, and love. In doing so, Abdullah ensures that old Pari is not forgotten but lives on as an invisible presence within his daughter's imagination, a testament to emotional fidelity and a proof of the power of memory to transcend loss.

Abdulla's final act of resistance against erasing Pari from his deteriorating memory is the letter he wrote to Pari. Written shortly after his diagnosis with Alzheimer, the letter - though brief - is emotionally saturated. He metaphorically frames it as a message left "on the shore," a final offering before he goes "under" (Hosseini, 2013, p. 400). These words evoke themes of submersion and silence - an inevitable decline into forgetfulness. However, the act of leaving the letter asserts emotional agency through his last attempt to communicate love beyond language and cognition. Thus, the note, the feathers, and naming his daughter all converge to depict Abdullah's enduring devotion and his resistance to forgetting, despite internal and external forces.

From Silence to Self-Narration: Tracing Roshi's Resilience

Roshi's story, though marginal in the novel, showcases Afghan women's suffering from male violence. It begins with Roshi's catastrophic loss of her family. Her uncle not only harmed her with an axe blow on her head but also executed her entire family for inheritance feuds. The act of wiping out an entire family is not an instance of gendered violence but a sign of a structurally failed society. This foundational trauma situates Roshi within what Spivak (1988) terms the "epistemic violence" of being rendered voiceless, stripped of identity, agency, and cultural memory.

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Upon her arrival at the hospital in Kabul, Roshi's traumatic case is framed through a clinical lens; her suffering is scientifically documented but not understood. Medical care is provided for her, but the institutional gaze remains limited. In postcolonial feminist terms, her body is visible, yet her story is invisible and reduced to a case, and her grief is quarantined within hospital walls. This period captures Mohanty's (2003) critique of Western feminist frameworks that focus on victimhood without context. Roshi's subjectivity is flattened; she is treated but not interpreted.

However, the nurse Amra emerges in Roshi's life not only as a healer but as a steadfast presence in her physical and psychological recovery. Amra appears as a figure of quiet yet persistent solidarity for Roshi. Though the novel does not explicitly attribute Roshi's authorship of her book to Amra's express encouragement, her unwavering care arguably lays the emotional basis for Roshi's articulation of her story after being let down by Idris. Both Roshi's ability to travel to the USA and her book dedication to Amra and Timur gesture toward the significance of Amra's role - primarily - and Timur's role - secondarily - in her journey from Afghanistan to the USA. Thus, with Amra's help, Roshi's voice is heard through the publication of her own story - not only to raise Western readers' awareness of Afghan women's suffering, but also to highlight their resilience, resistance, and agency.

Therefore, Roshi has completed a full arc - from silent survivor to authorial witness. Her resilience is not merely psychological; it is archival. She refuses to be footnoted in someone else's narrative. Her memoir disrupts the politics of forgetting and becomes what Mohanty (2003) terms an expression of resistant agency, an intentional, situated act of defiance against both patriarchal violence and postwar amnesia.

Complicity and Redemption: Nabi as a Postcolonial Feminist Mediator

Nabi's character occupies a morally complex space; he is both complicit in the patriarchal transaction that separates Pari from her family and a reflective narrator who seeks to repair the rupture he helped create. His long letter to Dr. Markos, which forms the core of the fourth chapter, is not merely a confession but a postcolonial archive of remorse, memory, and attempted restitution. Nabi's initial role in facilitating Pari's adoption serves a dual purpose: it provides a solution to Nila's infertility and alleviates Saboor's poverty, while also subtly advancing Nabi's own desire to win Nila's affection and position himself as her confidant - if not romantic partner. However, the transaction itself, according to Ahmad and Khan (2020), exposes the emotional and ethical costs of patriarchal logic disguised as benevolence.

Yet, Nabi's narrative arc complicates a reductive reading of him as merely a patriarchal agent. His letter reveals a deep awareness of the consequences of his actions: "I was the instrument of his [Saboor's] family's rupture," he writes, acknowledging the emotional violence embedded in his decision (Hosseini, 2013, p. 105). This self-reflexivity aligns with postcolonial feminist frameworks that emphasise the importance of male complicity being interrogated and transformed. Rather than defending his actions, Nabi seeks to transform and create a pathway for healing by entrusting Dr. Markos with the task of reconnecting Pari with her origins. His gesture of leaving the house and his belongings to Pari, along with a letter, serves as an act of restitution, a quiet act of resistance against the erasure of female memory and agency.

Moreover, Nabi's role as caregiver to Suleiman Wahdati and later as a host to Dr. Markos positions him as a facilitator of transnational solidarity. His emotional labour and decision to remain in the house long after Suleiman's death reflect a form of masculine caregiving that challenges dominant patriarchal norms. In this sense, Asghari, Ramish, and Zawuli (2021) note that Nabi's character "circulates power through service and emotional attachment rather than domination," offering a counter-narrative to hegemonic masculinity. In postcolonial feminist terms, Nabi is not a hero but a mediator, a figure who bridges ruptured histories and facilitates the reconstruction of silenced narratives. His remorse, though not performative, is embedded in a lifelong effort to repair what was broken. Through his letter, he becomes a witness to the consequences of patriarchal exchange and a quiet agent of feminist restoration.

Conclusions

Khaled Hosseini's *And the Mountains Echoed* constructs a multi-voiced tapestry of ruptured familial ties, gendered silences, and complex paths toward reclamation. Through the fragmented yet converging narratives of Pari, Nila, Abdullah, Roshi, Nabi, and others, the novel refuses a singular narrative of victimhood or agency. Instead, it gestures toward the layered ways in which Afghan women and their allies negotiate trauma, memory, and identity in patriarchal and diasporic landscapes.

Pari's emotional repression, Abdullah's mnemonic caregiving, Roshi's textual testimony, and Nabi's lettered remorse each embody facets of postcolonial feminist resistance - often subtle, occasionally ambivalent, but always resonant. As Mohanty (2003) and Spivak (1998) argue, reclaiming agency requires not only vocalisation but a situated understanding of history, power, and relational solidarity. In this context, voice is not merely a spoken utterance; it is an archive of loss, endurance, and ethical reconstruction.

Ultimately, the novel's echoes do not fade; they reverberate across time, reminding readers that in the aftermath of fragmentation, healing begins with the courage not only to remember but to narrate. Hosseini's layered storytelling invites readers to listen closely to the murmurs of the silenced, to

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honour the emotional labour of restoration, and to affirm that agency, however delayed or silenced, is always political.

Despite these insights, the study is not without limitations. First, the analysis is confined to a single literary text, which restricts the generalisability of its conclusions. While *The Mountains Echoed* provides a compelling case study, Afghan women's experiences are diverse and cannot be fully encapsulated within one narrative. Future analyses could benefit from a comparative approach, examining multiple texts by Afghan authors, particularly women writers, to broaden the scope of inquiry.

Second, the article relies heavily on interpretive analysis and theoretical frameworks, which - while rigorous - are inherently subjective. Moreover, the researcher's personality, shaped by academic training, cultural background, and ideological commitments, inevitably influences the reading of the text. Although this subjectivity is acknowledged and embraced within postcolonial feminist methodology, it nonetheless limits the study's neutrality and reproducibility.

Third, the absence of empirical data, such as interviews with Afghan women or comprehensive critical studies of the novel, means that the analysis remains within the realm of textual interpretation. Furthermore, incorporating reader responses or authorial intent could offer additional layers of insight into how the novel is received and understood across different cultural contexts.

Finally, the study focuses primarily on gender and postcoloniality, leaving other intersecting dimensions - such as class, religion, and ethnicity - less explored. These factors undoubtedly shape Afghan women's experiences and representations, and their inclusion in future research would enrich the analytical framework.

Despite all these limitations, the paper contributes meaningfully to postcolonial feminist literary criticism by foregrounding the nuanced ways in which silence, voice, and agency are constructed in the novel. Consequently, it invites readers and scholars to reconsider how Afghan women are imagined in literature, not as static symbols but as dynamic subjects, navigating complex histories and identities.

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Perception de la culture de sécurité dans les entreprises du secteur minier à Lubumbashi

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Résumé

Cette étude s'est interrogée sur la place qu'occupe la sécurité au travail dans l'exécution des tâches au sein des entreprises Ruashi Mining et Chemaf, c'est-à-dire déterminer la place de la sécurité dans les arbitrages de la culture organisationnelle au travail dans ces entreprises. Elle s'est servie des méthodes d'enquête, descriptive, comparative, des techniques du documentaire et du questionnaire conçu sous forme d'échelle de Likert. Ces instruments ont été appliqués sur un échantillon de 420 agents repartis de la manière suivante : 240 pour l'entreprise Ruashi Mining et 180 agents pour l'entreprise Chemaf, extrait grâce à la méthode d'échantillonnage aléatoire systématique. L'étude s'est déroulée sur la période allant de 2019 à 2023. Sa référence théorique s'appuie sur le postulat d'Icsi (2017, p.12), selon lequel : « toute entité organisationnelle a une culture de sécurité ; au sens où les acteurs partagent certaines manières de faire et de penser, qui ont des conséquences sur la sécurité. Et la culture de sécurité reflète la place que la culture organisationnelle donne à la sécurité dans toutes les décisions, tous les services, tous les métiers, et à tous les niveaux hiérarchiques ». Après avoir analysé les données grâce au logiciel SPSS, et après les avoir traités au moyen de test non paramétrique **Khi-deux de Pearson**, de test **t** et de test **z**. Les résultats renseignent que la sécurité au travail n'occupe pas une place importante dans l'exécution des tâches au sein de ces deux entreprises. La sécurité au travail qui existe au sein des entreprises Ruashi Mining et Chemaf, est une sécurité spéculative, car ne s'appuyant sur aucune norme internationale

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en matière de sécurité au travail, à l'instar d'ISO 45001, la norme 48001 et OHSAS 18001. Ce qui justifie l'occurrence des accidents de travail dans ces entreprises.

Mots clés : Sécurité, sécurité au travail, culture de la sécurité au travail et perception de la sécurité au travail

Perception of Safety Culture in Mining Sector Companies in Lubumbashi

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Abstract

This study examined the place that workplace safety occupies in the execution of tasks within the companies Ruashi Mining and Chemaf. It used the psychosocial survey method, documentary techniques, interviews and a questionnaire designed in the form of a Likert scale. These instruments were applied to a sample of 420 agents distributed as follows: 240 for the Ruashi Mining company and 180 agents for the Chemaf company, extracted using the systematic random sampling method. The study took place over the period from 2019 to 2023. Its theoretical reference is based on the postulate of Icsi (2017, p.12), according to which: "every organizational entity has a safety culture; in the sense that the actors share certain ways of doing and thinking, which have consequences on safety. And the safety culture reflects the place that the organizational culture gives to safety in all decisions, all services, all professions, and at all hierarchical levels." After analyzing the data using SPSS software, and after processing them using Pearson's non-parametric Chi-square test, t-test and z-test. The results indicate that workplace safety does not occupy an important place in the execution of tasks within these two companies. The occupational safety practices within Ruashi Mining and Chemaf are speculative, as they are not based on any international occupational safety standards, such as ISO 45001, 48001, and OHSAS 18001. This explains the occurrence of workplace accidents in these companies.

Keywords: Safety, occupational safety, workplace safety culture, and perception of workplace safety

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Introduction

Le renforcement d'une culture de sécurité au travail vise à développer une perception du risque partagée par tous les membres de l'entreprise, avec comme résultat un ensemble de comportements et de pratiques sécuritaires réduisant significativement la fréquence et la gravité des accidents, Rigaud Carine (2022).

Marcel Simard dans l'ICSI (2017), définit la « culture de sécurité » comme « l'ensemble des pratiques développées et appliquées par les principaux acteurs concernés pour maîtriser les risques sociotechniques de leur métier ». L'emploi du mot « sociotechniques » est à relier aux trois facteurs cités plus haut. Le terme « pratique » quant à lui précise à la fois :

- La façon d'agir (comportements répétés habituels et acceptés) comme par exemple le port des équipements de protection individuelle (EPI), le respect des règles, le recours aux analyses de risques.
- La façon de penser (valeur, importance accordée à la sécurité, convictions, …).

Fonction de la culture de sécurité

Pour Fernández-Muñiz, (2007), la culture de sécurité est définie comme étant un ensemble de valeurs, perceptions, attitudes, de comportements sécuritaires des membres de l'organisation, de l'ensemble de politique, pratiques et procédures de sécurité implanté à tous les échelons de l'organisation, visant la réduction l'exposition des travailleurs aux risques, et reflétant par conséquent l'engagement positif des hauts responsables en matière de sécurité.

Trois facteurs majeurs de la culture de sécurité peuvent être mis en évidence à savoir :

- L'engagement managers en matière de sécurité : selon Fernández-Muñiz, l'engagement des managers influence positivement et d'une manière directe le système management et l'implication des travailleurs à la sécurité au travail.
- L'engagement des travailleurs à la sécurité : Une deuxième fonction de la culture est, lorsque le management parvient à faire adhérer le plus grand nombre des employés à des façons de penser et d'agir en sécurité communes et convergentes, de fournir à l'entreprise un mécanisme effectif de coordination entre les acteurs concernés. Ce mécanisme de coordination est complémentaire et indispensable à la structure d'autorité pour que cette dernière soit exacte. Daniellou. F, Simard. M, & Boissières. I, (2010, p.104).
- La politique et procédures qui forment le système management de sécurité.

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La diversité des cultures de sécurité

Il arrive qu'une entreprise cherche à copier le Système de Management de la Sécurité (SMS) d'une autre organisation, mais elle ne pourra pas faire de même pour sa culture de sécurité. En effet, c'est ce que les acteurs internes parviendront à construire ensemble comme pratiques durables en sécurité, qui constituera leur culture. D'où l'observation de déférences culturelles quelquefois importantes entre les entreprises, parfois même à l'intérieur d'un même secteur d'activité. D'où l'importance de parler de la typologie de la culture de sécurité.

La typologie suivante permet d'appréhender cette diversité en définissant quatre grands types de culture de sécurité. Elle est construite à partir de l'idée développée dans la section précédente à l'effet qu'en matière de sécurité, la culture est une construction humaine édifiée principalement par deux acteurs collectifs en interaction, soit le management et les employés d'exploitation. Or, bien que concerné en principe, chacun de ces acteurs, en pratique, peut-être plus ou moins impliqué, actif et moteur dans la prise en charge de la sécurité, donc dans sa construction culturelle. Daniellou. F, Simard. M. et Boissières. I (2010).

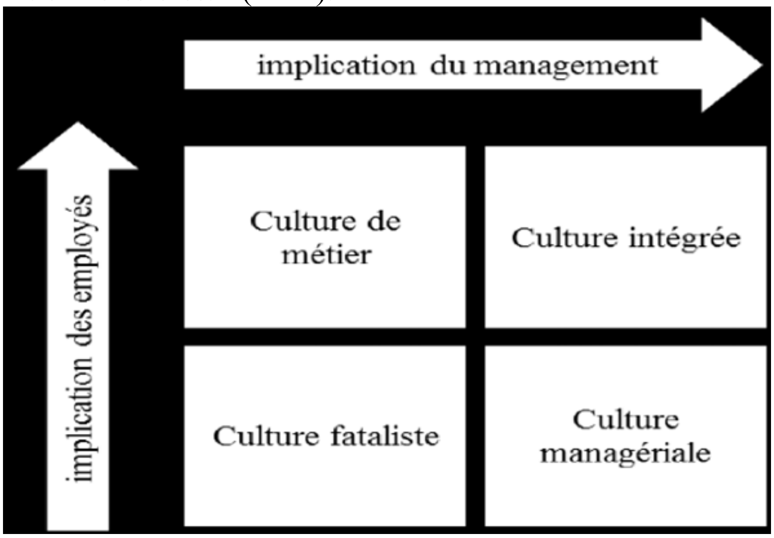

Figure 1 : Quatre types de culture de sécurité selon Marcel Simard (2010)

Daniellou. F, Simard.M et Boissières. I (2010), continuent en donnant les détails sur la typologie de culture de sécurité :

- **La culture fataliste de sécurité**

La croyance à la base de cette culture est que les accidents qui surviennent sont une fatalité, un coup de malchance, bref sont inévitables. Par conséquent, les acteurs ont plutôt comme attitude de ne rien faire pour les éviter, convaincus qu'ils sont que les accidents surviendront de toute façon.

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- **La culture de métier en sécurité**

Ce type de culture en sécurité se caractérise par une faible implication du management qui considère que les questions de prévention des accidents du travail sont du ressort des salariés. En conséquence, ces derniers deviennent l'acteur le plus impliqué en sécurité.

- **La culture managériale de sécurité**

Ce type de culture de sécurité se développe lorsque le management prend en charge le dossier de la sécurité industrielle et au poste de travail, et exerce un rôle tellement prépondérant dans l'élaboration et le déploiement des mesures de sécurité, techniques et procédurales, que l'implication des opérateurs se limite souvent à leur responsabilité d'appliquer ces mesures dans l'exécution du travail.

- **La culture intégrée de sécurité**

Ce type de culture de sécurité correspond à une situation où le management continue d'assumer le leadership de l'action en matière de sécurité, tout en développant diverses pratiques pour favoriser une forte implication des opérateurs dans plusieurs activités du management de la sécurité et dans l'application rigoureuse des mesures de sécurité.

Typologies selon les attributs souhaitables de la culture de sécurité

Icsi (2017, pp.80-83), présente les typologies selon les attributs souhaitables de la culture de sécurité :

- Une culture informée : l'organisation collecte et traite les informations pertinentes ;
- Une culture du reporting : chaque acteur est confiant sur la possibilité de rapporter des informations relatives à la sécurité sans craindre de blâme ;
- Une culture apprenante : l'organisation apprend des événements et fait évoluer les conditions non sûres ;
- Une culture flexible : la chaîne de commandement peut être reconfigurée si les circonstances l'exigent ;
- Une culture juste : la frontière entre comportements acceptables et inacceptables est partagée. Les comportements inacceptables sont traités de façon cohérente, juste et équitable. Les contributions positives sont reconnues.

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Comprendre et mesurer les progrès des comportements sécuritaires

Diverses méthodes ont été conçues pour étudier la conscience de la situation sécuritaire (SART, SAGAT …) et tendre à comprendre et mesurer les progrès des comportements sécuritaires en vue d'installer durablement une culture efficace de sécurité dans les entreprises. Rigaud Carine (2022).

Au premier stade, le salarié ne se préoccupe de sa sécurité que par instinct de conservation, la fréquence des accidents est élevée. Ce **premier stade dit « réactif »** Les salariés ne se sentent pas totalement concernés. Ils agissent plus par instinct et considèrent que les accidents sont inévitables et en effet, ils finissent par se produire souvent. Ils croient que la sécurité résulte davantage de la chance que de la gestion des risques professionnels. La réflexion sur la prévention est surtout ressentie comme une perte de temps. *L'objectif de « zéro accident »* est irréaliste, impensable : il y aura toujours des concours de circonstances malheureuses. L'entreprise vise simplement à essayer de se conformer au minimum pour échapper aux poursuites, il y manque flagrant d'engagement de la direction. Les employés sont fatalistes et estiment normal que dans les travaux dangereux les accidents surviennent. On attend l'accident pour réagir.

Au deuxième stade, il le fait par obéissance à des règles imposées par sa hiérarchie, la fréquence des accidents est modérée. Ce **deuxième stade dit « de dépendance »** la sécurité s'apparente à l'obéissance, elle est le fruit d'une contrainte réglementaire et autoritaire. Les salariés pensent que la sécurité consiste à suivre les règles élaborées la hiérarchie. Le nombre d'accidents diminue et la direction considère que la sécurité pourrait être contrôlée « si seulement les gens suivaient les règles ». Le suivi de règles de sécurité est le seul moyen de prévenir l'accident, même si celles-ci sont obsolètes, inadaptées à l'évolution du contexte. La formation se limite le plus souvent à la lecture des consignes. **L'objectif « zéro accident » parait très difficilement atteignable, cela relèverait du miracle**. L'entreprise mise sur le respect des règles et procédures, le contrôle, la discipline et les sanctions en cas de manquements.

Au troisième stade, il prend conscience que ces enjeux sont importants pour lui, la fréquence des accidents est faible. **Ce troisième stade dit « d'indépendance »,** les salariés se responsabilisent. Ils prennent conscience que les enjeux de la sécurité sont importants pour leur santé et leur sécurité et qu'ils peuvent améliorer la situation aussi par leurs propres actions, ce qui réduit encore davantage le nombre d'accidents. **L'objectif « zéro accident » est estimé éventuellement possible, mais avec beaucoup de chance**. La direction de l'entreprise s'efforce de développer la formation en SST qu'elle propose à ses employés, elle affiche son engagement et sa politique de sécurité.

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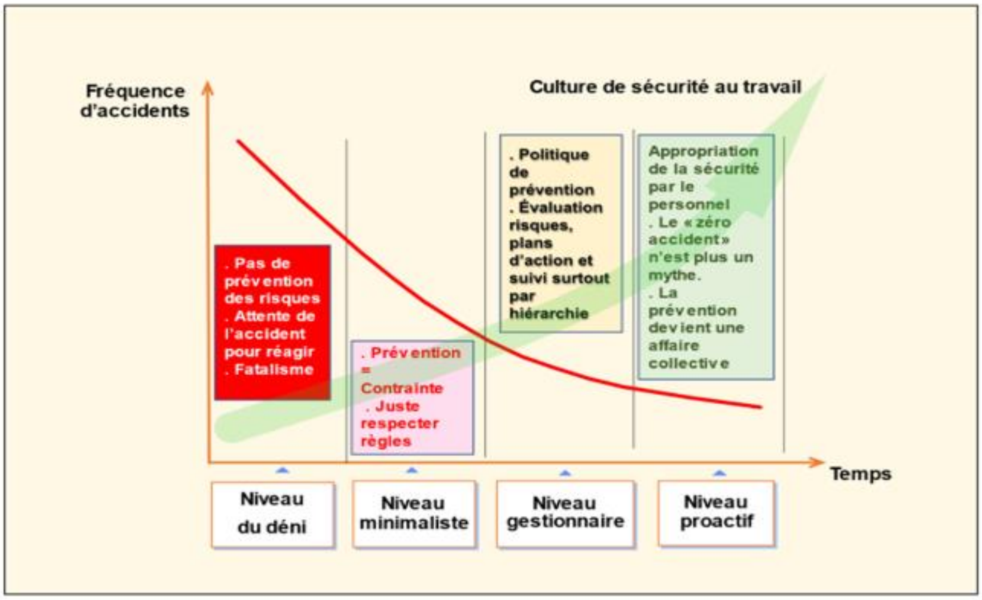
Et au quatrième stade, le salarié se rend compte que la sécurité est une question d'équipe, la fréquence des accidents est très faible. Au fur et à mesure des niveaux, le risque global diminue et la culture de la sécurité s'améliore. **Le quatrième stade dit « d'interdépendance »,** les salariés sont dans l'appropriation ; ils deviennent acteurs de leur propre sécurité et de celle de leurs collègues. Ils acceptent des normes strictes concertées, collaborent avec les experts HSE et signalent les risques. Ils souhaitent, réclament et obtiennent une formation régulière à la sécurité du travail. Ils appréhendent la sécurité comme une question collective et discutent activement avec les autres pour comprendre leur point de vue. Ils estiment qu'une véritable amélioration n'est possible que s'ils agissent comme un groupe et que l'absence totale d'accidents est un objectif réalisable.

Selon Rigaud Carine (2022), quand on passe d'un stade à l'autre, les comportements individuels passifs laissent la place à l'initiative collective *: la prise de risques et le nombre d'accidents diminuent*. La courbe de Bradley a donc un réel intérêt en entreprise pour mesurer et ensuite agir sur les comportements et développer une culture commune de la sécurité. Il s'agit d'identifier les niveaux de culture de sécurité et de comprendre et mesurer les progrès des comportements sécuritaires :

Niveaux de la culture de sécurité au travail



Source : https://www.officiel-prevention.com/dossier/formation/formation-continue-a-la-securite/la-culture-de-securite-au-travail

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Tableau 1 : Prévention des accidents de travail

Niveau Déni : Prévention = il suffit de faire attention	***Niveau Minimaliste : Prévention = Contrainte***	***Niveau Gestionnaire : Prévention = Administration***	***Niveau Proactif : Prévention = Engagement et Appropriation collective***
Absence de DUERP (document unique d'évaluation des risques professionnels) ; Aucune formation à la sécurité ; Quelques EPI (équipement de protection individuelle) attribués mais sans sensibilisation aux risques et contrôle d'efficacité ; Minimalisation par la Direction de la gravité et fréquence des risques potentiels ; Refoulement collectif du danger : attente de l'accident pour réagir.	Seulement éviter d'être trop en infraction vis-à-vis du Code du Travail ; Sentiment faire juste l'indispensable de prévention des risques pour ne pas engager sa responsabilité pénale ; DUERP reste au niveau de la direction : c'est seulement un document « administratif » ; Réunions CSSCT purement formelles ; Formation sécurité parcellaire : vue uniquement comme une couverture en cas d'accident ; Actions sécurité non planifiées et axées sur de la protection individuelle principalement	DUERP réalisé en collaboration avec les instances du personnel mais sans réelle appropriation collective ; Définition d'une politique de prévention à l'aide d'objectifs purement globaux de sécurité et d'amélioration des conditions de travail et des consignes et procédures générales ; Démarche SST au coup par coup : analyse et plan d'actions seulement à la suite d'accidents graves ou répétés, avec un budget correctif attribué seulement à but correctif ; Actions de formations SST ciblées mais sans plan d'ensemble ; Implication superficielle de la Direction Générale : délégation de la SST aux responsables locaux et aux experts HSE ; Règlement intérieur avec des dispositions seulement formelles.	Prise en compte partagée par tous les acteurs de l'entreprise et réelle démarche d'amélioration continue ; Vision globale des risques de l'entreprise et fixation détaillée d'objectifs concertés avec priorisation et suivi, avec une forte implication de la Direction Générale ; Politique de prévention concrète avec des plans d'actions (objectif, responsable, délais, moyens humains et financiers dédiés) impliquant chaque niveau de responsabilité ; Efforts conséquents dédiés à la formation et sensibilisation des salariés aux risques professionnels ; Valorisation de la mission du CHSCT et du retour d'expérience ; Benchmarking des meilleures pratiques à l'extérieur de l'entreprise.

Source :https://www.officiel-prevention.com/dossier/formation/formation-continue-a-la-securite/la-culture-de-securite-au-travail

Le problème de la sécurité au travail observé dans les entreprises Ruashi Mining et Chemaf de Lubumbashi se résume dans les faits ci-après :

- L'absence de normes de sécurité au travail ;
- Le manque de politique de sécurité au travail ;
- Le manque de déclaration en matière de sécurité au travail ;
- L'inexistence de la formation en sécurité au travail ;
- L'inefficacité de la communication en matière de sécurité au travail ;
- Le manque des débats sur la sécurité au travail ;

- L’irrégularité dans l’octroi des équipements de protection individuelle ;
- L’absence de l’analyse des dangers du travail ;
- Un journalier commis sur le site Kalukuluku de l’entreprise Chemaf, s’est vu amputer de ses doigts de la main gauche en janvier 2019, pour éviter des poursuites judiciaires, l’entreprise était obligée de l’engager ;
- Un étudiant de BAC3 de l’Ecole Supérieur des ingénieurs Industriels (ESI) de l’Université de Lubumbashi en stage, a été impliqué dans un accident qui l’a conduit à l’amputation du doigt en février 2019 à Ruashi Mining. L’entreprise avait jugé bon de l’engager, afin d’éviter des poursuites judiciaires. Depuis lors, l’entrée sur le site de Ruashi Mining pour les stagiaires et chercheurs, est conditionnée par la souscription à une assurance, pour qu’en cas d’accidents sur le site, la Sonas s’occupe de la prise en charge des accidentés.

Ces faits observés nous ont permis de formuler la question principale de notre recherche de la manière suivante : Quelle place la culture organisationnelle donne-t-elle à la sécurité dans l’exécution des tâches au sein des entreprises Ruashi Mining et Chemaf/Lubumbashi ? Quel est le niveau de la sécurité au travail dans chacune de ces entreprises ? Compte tenu du cadre théorique, nous pensons que la sécurité au travail occupe une place moins importante dans l’exécution des tâches au sein des entreprises Ruashi Mining et Chemaf/Lubumbashi. Cela s’explique par le fait que la culture organisationnelle ne véhicule pas les manières de faire et de penser susceptibles de valoriser la sécurité au travail. Toutefois, l’entreprise Ruashi Mining peut avoir un niveau de sécurité au travail légèrement supérieur à celui de l’entreprise Chemaf, dans ce sens qu’une politique de sécurité aurait déjà existé à Ruashi Mining à l’époque où cette entreprise était entre les mains des Sud-Africains. Par contre, depuis l’existence de l’entreprise Chemaf la politique de sécurité n’aurait jamais existé.

Revue de littérature

Nous n’avons pas la prétention d’avoir la primauté de recherche dans le domaine de la sécurité au travail. Bien des recherches ont déjà été réalisées.

Ainsi Daniellou (2017), trouve que lorsque les salariés placés dans une situation dangereuse dont ils n’ont pas la maitrise peuvent être convaincus « qu’il n’y a pas d’accidents ». Cette défense peut les conduire à nier le danger, et à prendre des risques. Cette conduite peut être encouragée par le collectif, voire dans certains cas de l’organisation.

A l’instar de ICSI (2017, p.12), qui dit que : « toute entité organisationnelle » a une « culture de sécurité », au sens où les acteurs

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partagent certaines manières de faire et de penser qui, ont des conséquences sur la sécurité. Et la culture de sécurité reflète la place que la culture organisationnelle donne à la sécurité dans toutes les décisions, tous les services, tous les métiers, et à tous les niveaux hiérarchiques ».

L'étude de Fernandez-Muniz et al. (2007) propose un modèle d'une culture de sécurité positive, dont les résultats ont montré le rôle important des managers dans la promotion de l'engagement des salariés en matière de sécurité, directement, par leurs attitudes et comportements et indirectement, en développant un système de management de sécurité. Cette étude a identifié les dimensions clés de culture de sécurité suivantes :

- Engagement des managers en matière de sécurité
- Engagement des salariés en matière de sécurité
- Le système de management de sécurité.

Après avoir passé en revue ces études, il se dégage une convergence entre notre étude et celles de nos prédécesseurs, dans ce sens que nous abordons tous la question de la sécurité au travail. Cependant, il se dégage une limite, qui s'explique par le fait que, ces études n'ont pas abordé l'aspect concernant la place de la sécurité au travail dans les arbitrages au sein des entreprises Ruashi Mining et Chemaf, c'est-à-dire l'influence de la culture organisationnelle sur la sécurité au travail, qui fait l'objet de cette recherche scientifique.

Par rapport au positionnement de l'approche, notre thèse souscrit à l'approche complémentaire qui est une combinaison de l'approche systémique et l'approche comportementale. Manuele (2000) mentionne que 73% des barrières à l'adoption de comportements sécuritaires proviennent des systèmes organisationnels et des équipements. Selon l'approche systémique, la clef de la réduction des accidents se trouve dans l'amélioration de l'ensemble des sous-systèmes et de leurs interactions qui constituent l'environnement de travail et déterminent l'état de la SST. Lorsque ces facteurs sont connus, contrôlés et intégrés dans un système de gestion, la SST ne peut que s'améliorer grâce à la compréhension que les gestionnaires et l'ensemble des acteurs acquièrent sur leur environnement de travail.

Notre dissertation doctorale trouve son soubassement scientifique sur la théorie des mécanismes du silence organisationnel de Daniellou (2017). Cette théorie souligne que « les mécanismes psychologiques que lorsque l'individu est placé dans une situation difficile à vivre, mais qu'il ne peut pas modifier, son inconscient peut modifier la perception de la situation pour la rendre plus supportable ». Ainsi, des salariés placés dans une situation dangereuse dont ils n'ont pas la maitrise peuvent se convaincre « qu'il n'y a pas d'accidents ».

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Méthodologie

Milieu de recherche

Notre étude a été réalisée dans les entreprises minières Ruashi Mining et Chemaf de Lubumbashi, RDC, durant la période allant de 2019 à 2023. La population cible de notre étude s'élève à 1710 agents, repartis de la manière que voici : 836 pour Ruashi Mining et 874 pour Chemaf.

Tableau 2 : Description de la Population de l'entreprise Ruashi Mining

N°	**Catégories** Direction	**Départements**	II	III	IV	V	VI	VII	VIII	Total
1	**Santé, sécurité et environnement**				5	4	3	10	3	25
2	**Maintenance**	Mécanique et Montage	15	21	21	16	18	3	12	106
		Garage		25	9	20	15		2	71
3	**Services Techniques**	Electricité		12	3		4	2	4	25
		Chaudronnerie		10	4		1	7		22
4	**Exploitation**	Mines	12	33	35	13	4	4	2	103
		Labo métallurgie		35	24	12	16		4	91
		Production	3	96	122	26	26	6	6	285
		Electrolyse		43	23	10	19	9	4	108
	Total général		30	275	246	101	106	41	37	836

De ce tableau découlent les informations suivantes :

- La Direction d'exploitation a un effectif de 587 agents repartis en quatre départements qui sont : le département de Mines avec 103 agents, le département de Labo métallurgie avec 91 agents, le département de production avec 285 agents et le département d'électrolyse avec 108 agents ;
- La plupart d'agents sont des catégories III (275) et IV (246).

Tableau 3 : Description de la Population de l'entreprise Chemaf

N°	**Catégories Directions**	**Départements**	II	III	IV	V	VI	VII	VIII	Total
1	Direction Technique	Service généraux	2	26	25	31	30	3	14	131
		Maintenance usine		7	8	3	5	3	10	36
		Magasin central		2	10	2	11		4	27
		Electricité		4	11	3	13	1	4	36
2	Direction d'exploitation	Production	25	120	107	36	45	9	14	356
		Labo métallurgie		46	32	5	7	1	2	93
		Electrolyse		25	29	7	12	1	2	76
		Mines		38	48	11	15	3	7	122
	Total général		27	268	270	98	138	20	53	874

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Dans ce tableau nous trouvons que :

- La direction d'exploitation a un effectif de 647 agents où le département de production a 356 agents, suivi du département des mines, qui a 122 agents. Dans la Direction technique, les départements des services généraux à un effectif de 131 qui dépassent de loin les autres départements.
- Les catégories professionnelles IV (270), et III (268) sont plus représentées que les autres.

❖ ***Critères d'inclusion et d'exclusion***

- Etre salarié de l'entreprise Ruashi Mining et de l'entreprise Chemaf ;
- Etre présent sur les sites d'exploitation des entreprises Ruashi Mining et Chemaf au moment de l'enquête, soit (du 05 aout au 15 septembre 2019 pour l'entreprise Chemaf et du 22 septembre au 25 octobre 2019 pour l'entreprise Ruashi Mining) ;
- Ont été exclus de l'étude tous les salariés absents sur les sites durant la période de collecte des données.

Echantillon de l'étude

L'échantillon de notre recherche est 420 agents repartis de la manière suivante : 240 pour l'entreprise Ruashi et 180 agents pour l'entreprise Chemaf. Il sied de préciser que cet échantillon a été extrait grâce à la méthode d'échantillonnage aléatoire systématique.

Tableau 4 : Description de l'échantillon de l'entreprise Ruashi Mining

N°	**Catégories** Direction	**Départements**	II	III	IV	V	VI	VII	VIII	Total
1	**Santé, sécurité et environnement**				3	5		4	1	13
2	**Maintenance**	Mécanique et Montage		11	2		9	1	4	27
		Garage		2	3	7	2			14
3	**Services Techniques**	Electricité		4	2		2	1		9
		Chaudronnerie		6				3	2	11
4	**Exploitation**	Mines	3	7	4	2	2			20
		Labo métallurgie		6	5	3	4			18
		Production	1	23	46	11	10	6	3	100
		Electrolyse		8	4		3	9	4	28
	Total général		4	67	69	28	32	24	14	240

Il ressort de ce tableau que la taille de l'échantillon pour l'entreprise Ruashi Mining s'élève à 240 agents, où la grande partie est constituée des agents de la direction d'exploitation du service de production soit 166 agents

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et les catégories professionnelles les plus représentées sont IV avec 69 agents et III avec 67 agents.

Tableau 5 : Description de l'échantillon de l'entreprise Chemaf

N°	**Catégories Départements**	II	III	IV	V	VI	VII	VIII	Total
4	Service de Sécurité		1	8	2	2	4	3	20
5	Service généraux	1		1	2	1	1	1	7
6	Maintenance usine		7	5	2	7		1	22
7	Magasin central		4	6	3	8	1	3	24
8	Electricité		5	4	4	10	1	2	25
9	Production		34	16	7	18	3	4	82
10	**Total général**	1	51	40	20	46	10	14	180

Nous trouvons dans ce tableau que la taille de l'échantillon de l'entreprise Chemaf est de 180 agents, où le service le plus représenté est le service de production avec 82 agents et la catégorie professionnelle la plus représentée est la catégorie IV avec 51 agents.

Outils utilisés

Cette recherche scientifique s'est servie des méthodes d'enquête, descriptive et comparative. La méthode d'enquête nous a permis d'entrer en contact avec les participants des deux entreprises, afin de leur expliquer l'objet de notre recherche et les sensibiliser pour leur faciliter la compréhension. Dans le but de leur permettre d'y participer en répondant seuls au questionnaire, pour nous aider à obtenir des informations fiables de leur part. La méthode descriptive nous a permis de déterminer grâce à une analyse statistique, la place que la sécurité au travail occupe dans les arbitrages de la culture organisationnelle au sein des entreprises Ruashi Mining et Chemaf. L'importance de la méthode comparative pour cette étude, réside dans le fait qu'elle nous a permis d'établir sur base des résultats inhérents à la place que la sécurité occupe dans les arbitrages, une comparaison entre l'entreprise Ruashi Mining et Chemaf. Les données ont été produites grâces aux techniques documentaire et du questionnaire. Grâce à la technique du questionnaire, nous avons pu consulter quelques documents inhérents à la gestion de la sécurité au travail dans les entreprises Ruashi Mining et Chemaf. La technique questionnaire a facilité la collecte des données. L'analyse du contenu a servi au dépouillement des données.

Résultats de l'étude

Après avoir analysé les données grâce à SPSS, et leur traitement au moyen du test non paramétrique Khi-deux de Pearson, le test t et le test z. Nous trouvons que la sécurité au travail n'occupe pas une place importante dans

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l'exécution des tâches au sein de ces deux entreprises. Nous considérons que la sécurité au travail dont on parle à Ruashi Mining et Chemaf, est une sécurité spéculative, dans ce sens qu'elle ne se fonde sur aucune norme internationale en matière de sécurité au travail. A l'instar d'ISO 45001, la norme 48001 et OHSAS 18001.

Tableau 6: La comparaison du niveau de culture de sécurité au travail des entreprises Ruashi Mining et Chemaf

Caractéristiques de la culture de sécurité au travail	Entreprises	N	Moyenne	Ecart type	Moyenne erreur standard
La conscience partagée des risques au travail	Ruashi M	240	2,054	1,2844	,0829
	Chemaf	180	1,872	1,2007	,0895
L'occurrence des accidents de travail	**Ruashi** M	240	3,550	1,3056	,0843
	Chemaf	180	3,333	1,1187	,0834
La culture de la transparence de sécurité au travail	Ruashi M	240	3,771	1,2846	,0829
	Chemaf	180	4,067	,9068	,0676
La culture intégrée de sécurité: la mobilisation de tous	Ruashi M	240	2,483	1,4636	,0945
	Chemaf	180	4,289	,7874	,0587
Le leadership du management et l'implication des salariés	Ruashi M	240	3,158	1,6210	,1046
	Chemaf	180	4,228	,9620	,0717
Equipement de protection individuelle	Ruashi M	240	2,783	1,5453	,0997
	Chemaf	180	4,100	,9921	,0740
Formation en matière de sécurité au travail	Ruashi M	240	3,425	1,7122	,1105
	Chemaf	180	4,139	1,2087	,0901
Communication sur la sécurité au travail	Ruashi M	240	3,108	1,5214	,0982
	Chemaf	180	4,211	1,1912	,0888
La culture interrogative de sécurité au travail	Ruashi M	240	3,433	1,6350	,1055
	Chemaf	180	4,222	1,3352	,0995

En analysant les données de ce tableau, nous avons trouvé que :

- Pour l'entreprise Ruashi Mining, la valeur de la moyenne générale est de 3,085 et celle de l'écart-type est 1,485 ;
- Pour l'entreprise Chemaf, la valeur de la moyenne générale est de 3,829 et celle de l'écart-type est 1,078.

En croisant les profils de deux entreprises, notre préoccupation est de trouver celle qui a un niveau de sécurité au travail supérieur à celle de l'autre. Pour ce faire, nous avons recouru au test z. Après le calcul, nous constatons que la valeur absolue du z (0,187) est inférieure à celle du z théorique (1,96), au seuil de 0.05. Nous acceptons l'hypothèse de nullité. Nous retenons qu'aucune entreprise n'a un niveau de sécurité au travail supérieur à l'autre. Ces résultats infirment notre hypothèse alternative (H3) émise dans notre introduction, qui stipulait que l'entreprise Ruashi Mining aurait un niveau de sécurité au travail légèrement supérieur à celui de l'entreprise Chemaf.

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Après avoir analysé les données dimension par dimension, nous passons à l'analyse du profil croisé pour comparer les deux entreprises.

Tableau 7: Profil de croisé de la sécurité au travail de deux entreprises Ruashi Mining et Chemaf profil de croisé de la sécurité au travail de deux entreprises Ruashi Mining et Chemaf

N°	**Caractéristiques de de sécurité au travail**	**Entreprises**	Echelle de niveau de sécurité				
			1	2	3	4	5
1	La conscience partagée des risques au travail	Ruashi M		2,054			
		Chemaf	1,872				
2	l'occurrence des accidents de travail	**Ruashi** M			3,550		
		Chemaf			3,333		
3	la culture de la transparence de sécurité au travail	Ruashi M			3,771		
		Chemaf				4,067	
4	la culture intégrée de sécurité: la mobilisation de tous	Ruashi M		2,483			
		Chemaf				4,289	
5	le leadership du management et l'implication des salariés	Ruashi M			3,158		
		Chemaf				4,228	
6	Equipement de protection individuelle	Ruashi M		2,783			
		Chemaf				4,100	
7	Formation en matière de sécurité au travail	Ruashi M			3,425		
		Chemaf				4,139	
8	Communication sur la sécurité au travail	Ruashi M			3,108		
		Chemaf				4,211	
9	La culture interrogative de sécurité au travail	Ruashi M			3,433		
		Chemaf				4,222	

L'analyse du profil croisé donne 3/9 pour l'entreprise Ruashi Mining et 1/9 pour l'entreprise Chemaf. Nous concluons que toutes les deux entreprises ont un niveau de sécurité au travail en dessous de la moyenne.

Nous avons mesuré l'importance que la culture organisationnelle accorde la sécurité au travail, afin de trouver la place qu'occupe la sécurité au travail dans l'exécution des tâches au sein de ces deux entreprises, par les attributs ou les caractéristiques de la culture organisationnelle favorisant la sécurité au travail.

Selon Amalberti, R. (2013), les caractéristiques souhaitables d'une culture organisationnelle favorable à la sécurité industrielle sont les suivantes : une conscience partagée des risques, une culture interrogative de sécurité au travail, une culture de transparence, une culture intégrée : mobilisation de tous, un système du management de sécurité et implication des salariés.

Les résultats du profil des deux entreprises relatives à la conscience partagée des risques d'accidents, nous permettent de constater que les salariés de ces deux entreprises sont conscients tous des risques d'accidents qu'ils courent, en travaillant sur les sites. Eu égard à ces résultats, il y a lieu d'infirmer que dans les entreprise Ruashi Mining et Chemaf, il y a la présence de la conscience partagée des risques d'accidents au travail, Car, nonobstant

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les conditions difficiles de travail, les travailleurs sont conscients les risques d'accidents sont permanents. A ce propos, Amalberti, R. (2013) cité par ICSI (2017, p.75), dit qu'il existe une conscience partagée des risques des accidents, lorsque la possibilité de connaitre les accidents graves est régulièrement rappelée, de façon à combattre le fatalisme (s'ils se produisent, ce ne sera pas « la faute à pas de chance »).

Par contre les résultats obtenus en rapport avec le profil de la culture interrogative dans ces deux entreprises, renseignent que la culture interrogative de sécurité au travail est relativement appliquée à Ruashi Mining. Car, les efforts sont quand même fournis pour la mise sur pied d'une politique de sécurité. Dans ce sens que, les lieux de travail sont assez aménagés, la question de la sécurité au travail est relativement abordée bien que c'est les moyens limités, et les enquêtes sont réalisées lorsqu'il y a accident, afin de trouver les causes, mais ce sont les mesures de correction qui font défaut. Pour Chemaf, les salariés rejettent catégoriquement l'existence de cette culture au sein de leur entreprise. Par le simple fait que la sécurisation des lieux de travail n'est pas une préoccupation pour l'entreprise, la sécurité au travail est une affaire individuelle, les débats sur la sécurité n'occupent pas une importante dans les arbitrages au travail, le travail est fait sans que les conditions ne sont réunies. Et l'entreprise n'a pas une norme internationale à laquelle elle s'identifie en matière de sécurité au travail.

Les résultats du profil croisé de deux entreprises Ruashi Mining et Chemaf inhérent à la culture de transparence de sécurité au travail, nous permettent de dire que les deux entreprises n'intègrent pas dans leurs pratiques au travail, la culture de transparence de sécurité. A la suite de l'absence de cette culture, il se constate les environnements du travail non sécurisés, le manque des inductions spécifiques, les règles de sécurité au travail ne sont pas affichées sur les lieux de travail, et les inspections et autres contrôles ne sont réalisés, pour voir si les conditions de travail sont sécurisantes ou non.

Les résultats en rapport avec la culture intégrée : mobilisation de tous, nous permettent de confirmer cette culture pour l'entreprise Ruashi Mining, où les employés approuvent son existence. Leur position se focalise sur la manière dont la sécurité au travail était gérée à l'époque où l'entreprise était entre les mains des Sud-Africains. Cette politique a permis la mise sur pied du comité d'hygiène et sécurité au travail, qui permet aux salariés de travailler en réunissant les quand même les conditions de travail, en signalant les dangers et autres erreurs sans être blâmés. Actuellement, cette culture de sécurité est en difficulté, dans ce sens que l'entreprise est entre les mains des capitaux chinois, qui n'accordent pas une attention soutenue à la sécurité au travail. Ce qui explique la position des certains agents qui estiment que la culture intégrée de sécurité avec la mobilisation de tous n'existe plus.

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Pour l'entreprise Chemaf, ces résultats nous permettent d'infirmer l'existence de cette culture de cette entreprise. Cela se justifie par le fait que, depuis que l'entreprise existe, c'est seulement en 2019 qu'elle a commencé à penser à la sécurité au travail. Donc, nous considérons que la sécurité au travail dans cette entreprise est au niveau embryonnaire. C'est pourquoi ils trouvent que la sécurité dans leur entreprise n'est pas encore au niveau d'être considérée comme une culture intégrée par tous.

Le profil au système du management de sécurité et implication des salariés, nous permet de dire que le système de management de sécurité n'existe pas à Ruashi Mining. Dans ce sens que cette entreprise il n'y a pas une norme internationale qu'elle observe en matière de sécurité. Toutefois, Ruashi Mining observe la norme ISO 14001 qui est une norme pour la gestion de l'environnement. Mais dans notre étude, il est question de rechercher la place de la sécurité au travail dans les arbitrages, qui doit être déterminée par la norme internationale, à l'occurrence OHSAS 18001 et la norme ISO 45001 qui mettent en place un système de management de sécurité au travail et l'implication des salariés, qui, malheureusement n'existe pas dans cette entreprise.

Parallèlement à l'entreprise Chemaf, où le système du management de sécurité au travail et implication des salariés est inexistant. Car, les dangers ne sont pas signalés par peur d'être sanctionné, les réunions de sécurité ne sont organisées avant d'effectuer les tâches, les travailleurs ne sont libres d'exprimer leurs opinions sur les conditions de travail, ce qui fait que la question de la sécurité ne fasse pas partie des échanges au quotidien dans cette entreprise.

Ces résultats nous conduisent à infirmer l'existence su système de management de sécurité au travail et l'implication des salariés au sein de ces entreprises. Car un système du management de sécurité au travail inclue une politique de sécurité, une motivation des salariés, une communication, une formation en matière de sécurité, une planification des actions de sécurité et le contrôle. Alors que dans ces entreprises ces dimensions n'existent pas. Ainsi, le manque ces indicateurs met en exergue l'inexistence du système du management de sécurité au travail et l'implication des salariés.

Notre modèle contributif

La contribution de cette thèse est présentée dans le schéma ci-dessous, où nous proposons un modèle de la culture organisationnelle dans laquelle la sécurité doit occuper une place importante dans l'exécution des tâches.

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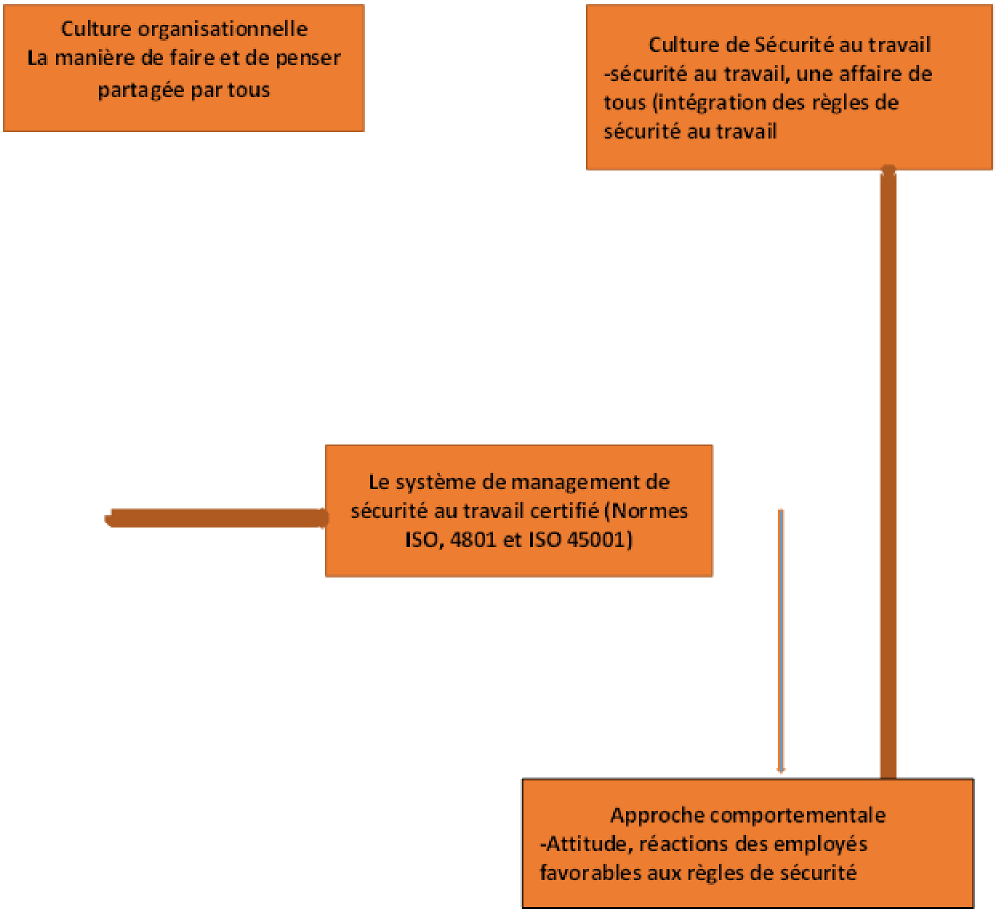

Figure 3 : Proposition d'un modèle de culture organisationnelle où la sécurité au travail fera partie intégrante des arbitrages dans ces entreprises

- **La culture organisationnelle** : d'après Icsi (2017, p.69), la culture organisationnelle désigne un ensemble de manières de faire et penser partagées par les acteurs d'une organisation. Pour ce qui est de notre recherche, ici nous voyons la manière dont les salariés échangent, dans le cadre du travail, dans leurs entreprises respectives. Ces échanges se font dans le cadre d'un système.

- **L'approche systémique** : dans cette approche, l'entreprise doit insérer les règles de sécurité suivantes :
  - Les mesures de performance en santé et sécurité au travail, pour être champion dans les principes de prévention contre les accidents de travail. Par ex : la sécurité avant tout ;
  - S'assurer toujours que les travailleurs sont aptes à travailler ;

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- Arrêter les comportements dangereux pour les travailleurs, la communauté et l'environnement ;
- Assurer sa propre sécurité ainsi que celle des autres en signalant les dangers, les blessures, les maladies et les incidents ;
- Utiliser toujours les équipements de protection appropriés à la tâche à effectuer ;
- Commencer toutes les réunions par les questions de sécurité au travail ;
- Etre conscient des procédures d'urgence sanitaires et sécuritaires dans son milieu du travail. Cette approche doit avoir des références en termes des normes.

➢ **La politique de sécurité au travail certifiée (Normes (ISO 14001 et ISO 45001)** : la norme ISO 14001 vérifie la compatibilité des mesures arrêtées dans le cadre de l'environnement, afin de les valider ou les certifier ; pour la norme IS0 45001, elle vérifie la compatibilité des mesures cadrant avec la sécurité au travail, afin de les certifier. Lorsque l'entreprise satisfait à ces exigences, cela signifie qu'elle s'est engagée à respecter la réglementation et à mettre en place une démarche de prévention et d'amélioration continue en matière de santé-sécurité au travail. La norme exige la mise en place d'un système de management de sécurité au travail avec comme contenu : la politique de sécurité, la formation, la communication, la planification des actions, le contrôle et le benchmaking, Cependant, ces mesures bien certifiées, si elles ne sont intériorisées par les employés, elles serviront à rien. C'est la raison de l'approche comportementale.

➢ **L'approche comportementale** : dans cette approche, nous trouvons : la perception, la croyance, l'attitude, la réaction, la réactivité des employés, etc…Si elles sont favorables aux règles de sécurité définies par la politique de sécurité de l'entreprise, elles permettront l'intériorisation de ces règles. Dès que l'intériorisation des règles de sécurité dans les arbitrages est effective, elle conduit à la mise en place **d'une culture de sécurité au travail.**

➢ **La culture de sécurité au travail** : ici, la sécurité au travail devient l'affaire de tous, en commençant par la haute hiérarchie jusqu'aux agents d'exécution. La sécurité devient une question à aborder dans tous les arbitrages ou débats, c'est-à-dire avant d'effectuer toute tâche.

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En somme, la contribution cette étude se situe à deux niveaux :

1. Cette étude constitue une source d'information scientifique importante, parce qu'elle met en exergue l'importance de l'approche mixe (approche systémique et approche comportementale) dans la gestion de la sécurité au travail, plus précisément dans les entreprises du secteur minier.
2. Les résultats de cette recherche serviront comme théories à intégrer dans l'enseignement des cours tels que : Psychologie du travail et des Organisations, hygiène et sécurité au travail, de législation et sécurité sociale, afin de permettre aux praticiens et chercheurs de mesurer l'importance de la sécurité au travail dans les arbitrages au sein des entreprises.

Conclusion

Cette étude vise à déterminer la place de la sécurité au travail dans les arbitrages de la culture organisationnelle dans les entreprises minières RUASHI MINING et CHEMAF de Lubumbashi. Nous postulons que la sécurité au travail occuperait une place moins importante dans l'exécution des tâches au sein des entreprises Ruashi Mining et Chemaf/Lubumbashi. Cela s'explique par le fait que la culture organisationnelle ne véhiculerait pas les manières de faire et de penser susceptibles de valoriser la sécurité au travail. Après avoir analysé les données grâce à SPSS, et leur traitement au moyen du test non paramétrique Khi-deux de Pearson, le test t et le test z. Les principaux résultats montrent que la sécurité au travail n'occupe pas une place importante dans l'exécution des tâches au sein de ces deux entreprises. Par ailleurs, nous avons trouvé qu'aucune entreprise n'a le niveau de sécurité au travail supérieur à l'autre, ce qui nous permet d'infirmer notre hypothèse alternative, selon laquelle l'entreprise Ruashi Mining aurait un niveau supérieur de la sécurité au travail à celui de l'entreprise Chemaf. La conséquence de nos résultats est que les entreprises Ruashi Mining et Chemaf sont exposées à des dépenses imprévues pour réparer les préjudices causés par les accidents et autres problèmes inhérents à la sécurité au travail : prise des accidentés, paiement des amandes et engagements imprévus.

Conflit d'intérêts : Les auteurs n'ont signalé aucun conflit d'intérêts.

Disponibilité des données : Toutes les données sont incluses dans le contenu de l'article.

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Estime de Soi et Persistance des Étudiantes en STIM à l'ENSAI de Ngaoundéré au Cameroun

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Résumé

La faible représentation des femmes dans les filières STIM (Sciences, Technologies, Ingénierie et Mathématiques) reste un enjeu majeur au Cameroun. À l'École Nationale Supérieure Agro – Industrielle (ENSAI) de l'Université de Ngaoundéré, cette réalité interroge la persistance des étudiantes dans ces parcours. Le phénomène de la sous – représentation des femmes dans les filières STIM, malgré diverses politiques incitatives, s'expliquerait par des facteurs psychosociaux, notamment l'auto – efficacité, la motivation intrinsèque et extrinsèque. Or, leur interaction et leur impact précis sur la persévérance restent peu mesurés empiriquement. Cette étude interroge, à travers l'estime de soi, l'influence de ces 3 facteurs sur cette persistance. Elle s'appuie sur un questionnaire administré aux 72 étudiantes issues de 14 filières, sélectionnées selon un échantillonnage par choix raisonné. Les résultats montrent que l'estime de soi concourt à la persistance des étudiantes en STIM. En effet, l'auto – efficacité permet aux étudiantes de croire en leurs capacités, de rester ambitieuses, persévérantes et résilientes face aux difficultés. La motivation intrinsèque, liée à l'autonomie, à l'autodétermination et à l'intérêt pour la filière, renforce leur engagement. Enfin, la motivation extrinsèque, soutenue par les encouragements des parents et des enseignants ainsi que par l'espoir d'un emploi bien rémunéré, renforce

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leur confiance et leurs choix. L'étude recommande la valorisation des modèles féminins de réussite pour encourager l'identification et la projection. Cette piste contribuerait à améliorer l'attractivité et la rétention des étudiantes dans les filières scientifiques et techniques de l'ENSAI et, plus largement, des grandes écoles scientifiques camerounaises.

Mots clés : Estime de soi, Persistance, STIM, Motivation, Sous – représentation féminine

Self-Esteem and Persistence of STEM Students at ENSAI in Ngaoundéré, Cameroon

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Abstract

The low representation of women in STEM (Science, Technology, Engineering, and Mathematics) courses remains a major issue in Cameroon. At the National Higher School of Agro–Industrial Sciences (NHSAS) of the University of Ngaoundéré, this reality raises questions about the persistence of female students in these courses. The under–representation of women in STEM subjects, despite various incentive policies, can be explained by psychosocial factors, in particular self–efficacy and intrinsic and extrinsic motivation. However, little empirical research has been done into the interaction between these factors and their precise impact on perseverance. This study examines the influence of these 3 factors on persistence through self–esteem. It is based on a questionnaire administered to 72 female students from 14 streams, selected on the basis of purposive sampling. The results show that self–esteem contributes to the persistence of female STEM students. Self–efficacy enables students to believe in their abilities and to remain ambitious, persevering, and resilient in the face of difficulties. Intrinsic motivation, linked to autonomy, self-determination, and interest in the course, strengthens their commitment. Finally, extrinsic motivation, supported by encouragement from parents and teachers and the hope of a well–paid job, strengthens their confidence and their choices. The study recommends promoting successful female role models to encourage identification and projection. This would help to improve the attractiveness and retention of female students in the

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scientific and technical streams at ENSAI and, more broadly, at Cameroon's leading science colleges.

Keywords: Self-esteem, Persistence, STEM, Motivation, Under-representation of women

Introduction

Dans un monde en constante évolution, le rôle des femmes dans le développement économique durable suscite un intérêt croissant. Le leadership féminin, l'entrepreneuriat et l'implication des femmes dans les secteurs à fort potentiel économique sont désormais perçus comme des leviers essentiels du progrès sociétal. L'accès des filles à l'éducation s'est progressivement démocratisé sous l'impulsion de politiques d'égalité promues à l'échelle internationale. Cette dynamique traduit une volonté politique affirmée d'égalité dans tous les domaines de formation, y compris les filières scientifiques et technologiques. Plusieurs initiatives, notamment celles pilotées par l'UNESCO depuis les années 2000, ont cherché à promouvoir l'éducation des filles en Afrique et leur insertion dans les carrières scientifiques. Pourtant, malgré ces efforts, la sous – représentation féminine dans les STIM (Sciences, Technologies, Ingénierie et Mathématiques) demeure préoccupante. Elle s'explique par des facteurs multiformes allant des normes sociales aux stéréotypes de genre profondément ancrés, en passant par un déficit persistant de modèles féminins dans ces domaines. Selon un article de CIO Mag (2023), la persistance des femmes dans les STIM en Afrique subsaharienne est fortement liée aux normes culturelles. Ces stéréotypes orientent les filles vers d'autres filières et limitent leur accès ou leur maintien dans les filières d'ingénierie.

À l'échelle mondiale, les femmes constituent environ 28 % des effectifs dans les filières STIM, avec des proportions particulièrement basses dans certains secteurs tels que les technologies de l'information et de la communication (3 %), l'ingénierie et la construction (8 %) ainsi que les sciences mathématiques (5 %) (Djeutsa, 2021 ; UNESCO, 2021). Au Cameroun, bien que l'État ait engagé d'importantes réformes éducatives, telles que la loi n°2023/007 du 25 juillet 2023 visant à améliorer l'équité dans l'enseignement supérieur, la présence des filles dans les écoles scientifiques reste marginale. À l'Université de Ngaoundéré, en particulier à l'ENSAI, les chiffres confirment cette disparité : en 2021, les étudiantes représentaient moins de 20 % des effectifs en STIM, avec des taux encore plus faibles dans certaines filières spécifiques. Par exemple, les filles ne comptent que pour environ 12 % en génie mécanique, 18 % en sciences alimentaires et à peine 9 % en chimie industrielle (source : ENSAI, 2021). Ces données confirment l'écart entre les sexes, malgré les dispositifs incitatifs. Les efforts institutionnels conjoints de l'État et de l'ENSAI se traduisent par des initiatives variées (campagnes de sensibilisation, programmes d'accompagnement, valorisation de l'inclusion) qui favorisent peu à peu un environnement plus propice à la participation des filles dans les STIM.

Malgré ces avancées, les facteurs culturels et sociaux continuent d'influencer de manière significative les trajectoires académiques féminines. De nombreuses études ont souligné la sous – représentation persistante des femmes dans les filières STIM, malgré des politiques d'encouragement à leur égard (Cheryan et al., 2017; Wang & Degol, 2017; Master et Meltzoff, 2016). Selon Fouad et al. (2017), le problème empirique, observable dans les universités, réside dans la diminution progressive du nombre d'étudiantes inscrites dans ces filières. Ils lient ce phénomène à des facteurs psychosociaux internes et externes. En effet, la confiance en ses capacités (auto – efficacité), la motivation propre (motivation intrinsèque) ainsi que les encouragements extérieurs (motivation extrinsèque) semblent façonner la persistance des étudiantes. Cependant, il manque encore des données quantitatives qui mesurent l'articulation précise de ces 3 dimensions et leur impact réel. Quant à notre problème théorique, il découle de la difficulté à modéliser l'interaction de ces facteurs, notamment en ce qui concerne la manière dont l'estime de soi influence tout à la fois la motivation intrinsèque et extrinsèque, et par là, la persévérance (Eccles & Wigfield, 2020; Gunderson et al., 2012). L'absence de consensus sur le modèle explicatif le plus pertinent complique l'identification de leviers d'action efficaces. Dans quelle mesure les dimensions de l'estime de soi, à savoir l'auto – efficacité, la motivation intrinsèque et la motivation extrinsèque, influencent – elles la persistance des étudiantes dans les filières STIM ?

La résolution, par cette recherche, de ce problème exploite un cadre théorique qui s'appuie sur la théorie sociocognitive de l'auto – efficacité (Bandura, 2007) et la théorie de l'estime de soi (Branden et Archibald, 1982). Bandura postule que l'auto – efficacité, croyance en ses capacités, influence la motivation et la persévérance, tandis que Branden et Archibald soutiennent le rôle de l'estime de soi comme moteur de l'action. Ensemble, ces théories expliquent comment une bonne estime de soi renforce l'auto – efficacité, alimentant la motivation intrinsèque (engagement personnel) et extrinsèque (reconnaissance externe). Ces mécanismes interactionnels éclairent les leviers d'action possibles. En effet, Degran, Desrumaux et Dose (2021), à la suite de Lachapelle (2020) expliquent que l'estime de soi est positivement liée au sentiment d'auto – efficacité, qui renforce la confiance en ses capacités. Elle est également corrélée à la motivation intrinsèque (engagement volontaire par intérêt) ainsi qu'à la motivation extrinsèque (actions motivées par des récompenses ou reconnaissance externe). L'hypothèse générale de cette étude est que l'estime de soi, observé dans les 3 dimensions que sont l'auto –

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efficacité, la motivation intrinsèque et la motivation extrinsèque, façonne la persistance des étudiantes dans les filières STIM. L'effet cumulatif de ces variables pourrait expliquer pourquoi, en dépit d'un environnement peu favorable, certaines femmes choisissent et réussissent dans des parcours longtemps perçus comme réservés aux hommes.

Cette étude permet de mieux comprendre les dynamiques individuelles et psychosociales qui sous – tendent le maintien et la réussite des étudiantes dans les filières STIM, notamment à l'ENSAI de Ngaoundéré, où les effectifs féminins restent faibles et très peu variables. Elle contribue à enrichir les travaux sur le genre, l'éducation et l'orientation académique en Afrique subsaharienne. Elle met l'accent sur les déterminants internes de la réussite et de la persévérance scolaire. Elle s'inscrit également dans le contexte des réformes éducatives camerounaises postérieures à la loi d'orientation de 1998, et du système LMD, en apportant une réflexion critique sur l'efficacité réelle de ces politiques en matière de genre. L'objectif principal de cet article est d'analyser les facteurs liés à l'estime de soi, en interaction avec d'autres variables psychosociales et institutionnelles, qui favorisent la persistance des étudiantes dans les filières STIM des Universités qui baignent dans le même contexte social. Les résultats obtenus serviront à formuler des recommandations pour améliorer l'accompagnement pédagogique et psychosocial des jeunes filles dans ces domaines stratégiques.

Notre investigation se poursuit par la présentation de la méthodologie, des résultats obtenus et leur discussion. Elle se termine par une conclusion.

Méthode de recherche

Notre méthode de recherche explique le type de recherche, l'échantillon et l'échantillonnage, l'instrument de collecte de données, la procédure d'analyse et les considérations éthiques.

Type de Recherche

La présente étude a été menée durant l'année académique 2021 – 2022. Elle adopte une approche quantitative, caractérisée par l'usage de données numériques ou ordinales pour permettre l'application de calculs statistiques. Ce choix repose sur l'objectivité des données recueillies, leur précision et leur fiabilité. Les résultats issus de ce type de recherche peuvent être généralisés à d'autres contextes ou populations similaires. Nos hypothèses spécifiques croisent successivement l'auto – efficacité (Ambition personnelle, persévérance, résilience), la motivation intrinsèque (Autodétermination, besoin d'autonomie, intérêt pour la filière), la motivation extrinsèque (Conseil parental, espoir d'un emploi bien rémunéré, conseil des enseignants) à la persistance des étudiantes en STIM.

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Échantillon et Échantillonnage

L'étude a été menée auprès des étudiantes inscrites dans les filières STIM (Sciences, Technologies, Ingénierie et Mathématiques) de l'ENSAI. La population cible comprend l'ensemble des étudiantes de l'établissement (ENSAI), tandis que l'échantillon final est composé de 72 étudiantes, sélectionnées selon un échantillonnage raisonné. En effet, le choix des participantes n'a pas été fait au hasard, mais repose sur des critères qui ont retenu les étudiantes jugées pertinentes et représentatives pour répondre aux objectifs de l'étude.

Instrument de Collecte de Données

L'instrument de collecte de données utilisé dans cette étude est le questionnaire. Ce questionnaire nous a permis d'identifier les tendances, d'explorer les relations entre variables, et éventuellement de prédire certains résultats. Il est subdivisé en 4 sections : informations sociodémographiques (âge, cycle d'étude, niveau d'ambitions personnelles dans l'ingénierie), liens respectifs entre l'auto – efficacité (Ambition personnelle, persévérance, résilience), la motivation intrinsèque (Autodétermination, besoin d'autonomie, intérêt pour la filière), la motivation extrinsèque (Conseil parental, espoir d'un emploi bien rémunéré, conseil des enseignants) et, la persistance des étudiantes en STIM. Ces 3 dernières sections ont été exclusivement mesurées à l'aide d'une échelle de Likert en 3 niveaux d'accord (5 = Tout à fait d'accord ; 3 = Plus ou moins d'accord ; 1 = Pas du tout d'accord). Chaque item de notre instrument a été élaboré pour mesurer un aspect sus – évoqué de l'estime de soi avec la persistance académique. Les associations de cette persistance ont été les suivantes : motivation (ambition personnelle), ténacité (persévérance), adaptabilité (résilience), engagement (autodétermination), indépendance (besoin d'autonomie), passion (intérêt pour la filière), soutien (conseil parental), projection (espoir d'un emploi bien rémunéré), encadrement (conseil des enseignants).

Procédures d'Analyse

L'analyse statistique a été réalisée avec le logiciel SPSS version 20.0. Les données ont été collectées de manière patiente, progressive et rigoureuse afin d'éviter la réduction de l'échantillon. Des statistiques descriptives ont ensuite été effectuées. Une analyse inférentielle a permis d'étudier les relations entre les variables. Ce processus a permis d'identifier l'influence des facteurs qui peuvent favoriser une plus grande participation des femmes dans les filières STIM.

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Considérations Éthiques

Toutes les démarches de cette étude ont respecté les principes éthiques de la recherche. Le consentement éclairé des participantes a été obtenu avant toute collecte d'informations. La confidentialité des informations personnelles a été strictement respectée, et les données ont été utilisées uniquement à des fins scientifiques.

Résultats

Cette section présente les informations sociodémographiques des participantes et les résultats de relatifs au lien entre l'auto – efficacité, la motivation intrinsèque, la motivation extrinsèque et, la persistance de leur choix dans les filières STIM.

Présentation des Informations Sociodémographiques des Participantes à l'Étude

Les données ont été recueillies à l'aide d'un questionnaire administré à 72 étudiantes issues de 14 filières de l'ENSAI. Toutes étaient engagées dans des filières relevant des STIM (Sciences, Technologies, Ingénierie et Mathématiques). L'échantillon offre une vue représentative de la diversité académique et des profils socio – académiques des étudiantes dans ce contexte. Les tableaux 1, 2 et 3 présentent respectivement les âges des participantes, leurs cycles d'étude des participantes et leurs ambitions personnelles à travailler dans l'ingénierie.

Tableau 1 : Âges des Participantes

Âge des participantes	Effectif	Pourcentage
De 20 ans à 25 ans	56	77,8
De 26 ans à 30 ans	9	12,5
Plus de 30 ans	7	9,7
Total	72	100,0

Selon ce tableau 1 sur 72 enquêtées, on dénombre 56 répondantes qui sont situées dans la tranche de 20 – 25 ans soit un taux de 77,8 %, 9 autres qui sont situées dans l'intervalle 26 – 30 (12,5 %) et 7 répondantes qui ont plus de 30 (9,7%). On observe une prédominance en cycle d'ingénieur des jeunes femmes de la tranche d'âge entre 20 – 25 ans.

Tableau 2 : Cycles d'Étude des Participantes

Cycle d'étude	Effectif	Pourcentage
Ingénieur	47	65,3
Master	9	12,5
Doctorat	16	22,2
Total	72	100,0

Au regard du tableau 2, sur les 72 répondantes, nous observons une prédominance des enquêtées de cycle Ingénieur où l'on compte 47 étudiantes (65,3 %). Nous avons 9 enquêtées en cycle Master (12,5 %) et 16 répondantes

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(22,5 %) font le cycle Doctorat. Ces chiffres semblent s'expliquer par le fait qu'après l'obtention du diplôme d'Ingénieur, les étudiantes cherchent leur insertion professionnelle.

Tableau 3 : Ambitions Personnelles des Participantes à Travailler dans l'Ingénierie

Ambitions personnelles	Effectif	Pourcentage
Tout à fait en accord	56	77,8
Plus ou moins en accord	14	19,4
Pas du tout en accord	2	2,8
Total	72	100,0

Le tableau 3 indique que sur les 72 enquêtées, nous avons 56 qui sont tout à fait en accord d'avoir pour ambition personnelle de travailler dans l'ingénierie, soit un taux de 77 ,8%. Nous avons 14 étudiantes (19,4 %) qui sont encore moins en accord d'avoir ce cheminement. Enfin, 2 enquêtées (2, 8 %) ne lient pas leur avenir professionnel à l'ingénierie. En définitive, 70 enquêtées ont pour ambition de rester dans l'ingénierie à la fin de leur étude, soit un taux de 97,2%. Cette prédominance nous fait croire à un engagement personnel caractérisé par une croyance en ses capacités, en ses compétences et une détermination à se réaliser.

Relation entre Estime de Soi et Persistance des Étudiantes en STIM

Cette partie nous permet de confirmer, de reformuler ou d'infirmer les 3 hypothèses suivantes :

- Première hypothèse : Plus les étudiantes ont confiance en leurs ambitions personnelles, leurs persévérances et leurs résiliences, plus elles sont susceptibles de persévérer dans les filières STIM.
- Deuxième hypothèse : L'autodétermination, le besoin d'autonomie et l'intérêt pour la filière renforcent la persistance des étudiantes dans les filières STIM.
- Troisième hypothèse : Les facteurs externes tels que le conseil parental, l'espoir d'un emploi bien rémunéré ou le conseil des enseignants (motivation extrinsèque) jouent un rôle positif dans le maintien des étudiantes dans les parcours STIM.

Auto – efficacité et Persistance des Étudiantes en STIM

Il s'agit de rechercher la corrélation entre les indicateurs de l'auto – efficacité (Ambition personnelle, persévérance, résilience) et la persistance des étudiantes dans les filières STIM.

Tableau 4 : Répartition des Étudiantes selon l'Ambition Personnelle

Modalités	Effectifs	Pourcentage
Tout à fait d'accord	56	77,8
Plus ou moins d'accord	14	19,4
Pas du tout d'accord	2	2,8
Total	72	100,0

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Dans le tableau 4, la majorité des participantes (97,2% = 77,8 % + 19,4 %) reconnaissent avoir été motivées par leur propre ambition personnelle. Cette ambition traduit une confiance élevée en leurs capacités, un élément central du sentiment d'auto – efficacité.

Tableau 5 : Répartition des Étudiantes selon la Persévérance

Modalités	Effectifs	Pourcentage
Tout à fait d'accord	47	65,3
Plus ou moins d'accord	19	26,9
Pas du tout d'accord	6	7,8
Total	72	100,0

Les données du tableau 5 indiquent que 92,2 % (65,3 % + 26,9 %) des étudiantes attribuent leur orientation à une forte persévérance. Cela renforce l'idée que la ténacité participe à leur maintien dans les filières STIM.

Tableau 6 : Répartition des Étudiantes selon la Résilience

Modalités	Effectifs	Pourcentage
Tout à fait d'accord	39	54,2
Plus ou moins d'accord	10	13,9
Pas du tout d'accord	23	31,9
Total	72	100,0

Dans le tableau 6, nous avons 68,1% des participantes (54,2 % + 13,9 %) estiment que leur résilience a contribué à leur persistance académique.

Tableau 7 : Matrice de corrélation entre Auto – efficacité et Persistance des étudiantes en STIM

Variables	1	2	3	4
1 = Ambition personnelle	1.000			
2 = Persévérance	0,52	1,000		
3 = Résilience	0,32	0,45	1,000	
4 = Persistance en STIM	0,79	0,84	0,71	1,000

Toutes les p – values associées sont < 0,001, donc toutes les corrélations sont statistiquement significatives.

Le tableau 7 nous permet de déduire la corrélation des 3 dimensions de l'auto – efficacité avec la persistance des étudiantes en STIM. Il apparaît qu'avec leur persistance, l'ambition personnelle est fortement et positivement corrélée ($r = 0,79$; $p < 0,01$). Il en est de même de la persévérance ($r = 0,84$; $p < 0,01$) et de la résilience ($r = 0,71$; $p < 0,01$). En effet, plus une étudiante affirme avoir été motivée par sa propre ambition, plus elle est susceptible de persister dans les études STIM. L'ambition joue ici un rôle de moteur initial et de confiance en soi. La ténacité et la capacité à continuer malgré les obstacles sont les prédicteurs les plus solides de la persistance. C'est un élément central du maintien dans un parcours exigeant. La capacité à rebondir après des échecs ou des difficultés a une influence réelle sur la persistance, mais un peu moins marquée que les 2 précédentes dimensions. Cela peut

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s'expliquer par une variation plus grande de la résilience parmi les répondantes. En définitive, les 3 dimensions de l'auto – efficacité contribuent de manière significative à la persistance des étudiantes en STIM.

Motivation Intrinsèque et Persistance des Étudiantes en STIM

Nous recherchons la corrélation entre les dimensions de la motivation intrinsèque (Autodétermination, besoin d'autonomie, intérêt pour la filière) et la persistance des étudiantes dans les filières STIM.

Tableau 8 : Répartition des Étudiantes selon l'Autodétermination

Modalités	Effectifs	Pourcentage
Tout à fait d'accord	40	55,6
Plus ou moins d'accord	13	18,1
Pas du tout d'accord	19	26,3
Total	72	100,0

Le tableau 8 indique que 73,7 % (55,6 % + 18,1 %) des étudiantes reconnaissent que leur autodétermination a été déterminante dans leur orientation vers les STIM. Ce résultat est en accord avec les conclusions de Deci et Ryan (2000), selon lesquelles la théorie de l'autodétermination stipule que la compréhension de la motivation humaine repose sur la satisfaction de 3 besoins psychologiques fondamentaux : la compétence, l'autonomie et la relation.

Tableau 9 : Répartition des Étudiantes selon le Besoin d'Autonomie

Modalités	Effectifs	Pourcentage
Tout à fait d'accord	58	80,6
Plus ou moins d'accord	11	15,3
Pas du tout d'accord	3	4,1
Total	72	100,0

On observe (tableau 9) que 95,9 % des répondantes (80,6 % + 15,3 %) attribuent leur persistance à un besoin fort d'autonomie, ce qui témoigne d'une motivation autodirigée.

Tableau 10 : Répartition des Étudiantes selon l'Intérêt pour la Filière

Modalités	Effectifs	Pourcentage
Tout à fait d'accord	53	73,6
Plus ou moins d'accord	9	12,5
Pas du tout d'accord	10	13,9
Total	72	100,0

On observe dans le tableau 10 que 86,1 % des répondantes estiment que leur intérêt pour la filière a motivé leur choix. Cet aspect illustre l'importance de la passion dans la persistance académique.

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Tableau 11 : Matrice de corrélation entre Motivation Intrinsèque et Persistance des étudiantes en STIM

Variables	1	2	3	4
1 = Autodétermination	1.000			
2 = Besoin d'autonomie	0,50	1,000		
3 = Intérêt pour la filière	0,45	0,55	1,000	
4 = Persistance en STIM	0,60	0,70	0,65	1,000

Toutes les p – values associées sont < 0,001, donc toutes les corrélations sont statistiquement significatives. Les analyses du tableau 11 révèlent des corrélations positives significatives entre les dimensions de la motivation intrinsèque et la persistance des étudiantes en STIM. Une corrélation modérée à forte ($\rho \approx 0{,}60$) est observée entre l'autodétermination et la persistance. Elle indique que les étudiantes qui se sentent autodéterminées sont plus susceptibles de poursuivre leur parcours dans ces filières. Le besoin d'autonomie présente une corrélation encore plus forte ($\rho \approx 0{,}70$). Elle suggère qu'il s'agit du facteur de motivation intrinsèque le plus étroitement lié à la persistance. De même, l'intérêt pour la filière affiche une corrélation forte ($\rho \approx 0{,}65$) ; elle souligne l'importance de la passion ou de l'engagement personnel dans la continuité des études. En définitive, la motivation intrinsèque, composée de l'autodétermination, du besoin d'autonomie et de l'intérêt pour la filière, montre un lien fort avec la persistance des étudiantes en STIM. Ces résultats confirment la théorie de l'autodétermination de Deci et Ryan (2000), qui soutiennent que la motivation autonome encourage l'engagement et la continuité dans les études. La forte significativité des corrélations indique que ces liens sont fiables et peu probables d'être dus au hasard.

Motivation Extrinsèque et Persistance des Étudiantes en STIM

Nous recherchons la corrélation entre les dimensions de la motivation extrinsèque (Conseil parental, espoir d'un emploi bien rémunéré, conseil des enseignants) et la persistance des étudiantes dans les filières STIM.

Tableau 12 : Répartition des Étudiantes selon le Conseil Parental

Modalités	Effectifs	Pourcentage
Tout à fait d'accord	40	55,6
Plus ou moins d'accord	10	13,9
Pas du tout d'accord	22	30,5
Total	72	100,0

Nous déduisons du tableau 12 que 69,5 % (55,6 % + 13,9 %) des étudiantes reconnaissent l'influence de leurs parents dans leur orientation. Cet état démontre le rôle des proches dans les décisions académiques.

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Tableau 13 : Répartition des Étudiantes selon l'Espoir d'un Emploi bien Rémunéré

Modalités	Effectifs	Pourcentage
Tout à fait d'accord	49	68,1
Plus ou moins d'accord	19	26,4
Pas du tout d'accord	4	5,5
Total	72	100,0

Nous observons dans le tableau 13 que 94,5% (68,1 % + 26,4 %) des étudiantes déclarent que la perspective d'un emploi stable et bien rémunéré a influencé leur choix. C'est un aspect qui renforce l'importance de la motivation financière.

Tableau 14 : Répartition des Étudiantes selon le Conseil des Enseignants

Modalités	Effectifs	Pourcentage
Tout à fait d'accord	40	55,6
Plus ou moins d'accord	26	36,1
Pas du tout d'accord	6	8,3
Total	72	100,0

Un total de 91,7 % (55,6 % + 36,1 %) des participantes (tableau 14) indiquent avoir été conseillées par leurs enseignants. Ceci le fort impact du corps professoral dans le choix des élèves.

Tableau 15 : Matrice de corrélation entre Motivation Extrinsèque et Persistance des étudiantes en STIM

Variables	1	2	3	4
1 = Conseil parental	1.000			
2 = Emploi bien rémunéré	0,40	1,000		
3 = Conseil enseignants	0,35	0,55	1,000	
4 = Persistance en STIM	0,45	0,70	0,65	1,000

Une analyse du tableau 15 suggère qu'avec un échantillon de 72 étudiantes, des corrélations de 0,45 ou plus sont généralement considérées comme statistiquement significatives ($p < 0,01$). On peut donc supposer une forte significativité des relations observées, en particulier entre la persistance et l'espoir d'un emploi bien rémunéré ($\rho \approx 0,70$), ainsi qu'entre la persistance et le conseil des enseignants ($\rho \approx 0,65$). Le conseil parental montre également une corrélation significative avec la persistance, bien que de manière plus modérée ($\rho \approx 0,45$). En définitive, les corrélations entre les variables extrinsèques et la persistance montrent des associations modérées à fortes, avec des liens statistiquement significatifs. Ces résultats confirment que les motivations liées aux perspectives professionnelles et au soutien éducatif impactent la décision des étudiantes de poursuivre une filière STIM.

Les résultats montrent que l'estime de soi façonne positivement dans la persistance des étudiantes dans les filières STIM, à travers trois leviers principaux. D'une part, l'auto – efficacité, qui renvoie à la confiance en ses ambitions, à la persévérance et à la résilience, permet aux étudiantes de croire

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en leurs capacités et de surmonter les obstacles rencontrés dans leur parcours (Hypothèse 1). D'autre part, la motivation intrinsèque, caractérisée par l'autodétermination, le besoin d'autonomie et l'intérêt personnel pour la filière, soutient leur engagement durable et renforce leur implication (Hypothèse 2). Enfin, la motivation extrinsèque, alimentée par les encouragements parentaux, les conseils d'enseignants et les perspectives d'un avenir professionnel prometteur, agit comme un levier de maintien dans ces cursus (Hypothèse 3). Ainsi, la validation des 3 hypothèses confirme que l'estime de soi, nourrie à la fois par la confiance individuelle et par des soutiens extérieurs, constitue un facteur central de persistance et de résilience chez les étudiantes engagées dans les filières STIM.

Discussion

Cette recherche aide à mieux comprendre pourquoi certaines étudiantes restent dans les filières STIM, notamment à l'ENSAI de Ngaoundéré, où le nombre de filles reste faible mais stable. Elle montre que des facteurs comme l'ambition, la persévérance, la résilience, l'autonomie et l'intérêt pour la filière jouent un rôle important. Ces étudiantes réussissent surtout grâce à leur motivation personnelle et au soutien qu'elles reçoivent. Par exemple, la persévérance ($r = 0,84$) et le besoin d'autonomie ($\rho \approx 0,70$) sont fortement liés à leur persistance. Ces 2 paramètres montrent que les étudiantes qui croient en elles – mêmes et veulent réussir sont plus motivées à rester dans ces filières difficiles. Les résultats montrent aussi que les encouragements des parents et des enseignants, ainsi que l'espoir d'un bon emploi, sont non négligeables. Sur le plan théorique, cette recherche enrichit les études sur le genre et l'éducation en Afrique. Elle applique des théories comme celles de Bandura (2007) ou de Deci et Ryan (2000) dans un contexte africain. Cette approche démontre l'universalité de certains concepts dans la compréhension des réalités locales. En somme, cette étude éclaire sur le rôle de la motivation, de la confiance en soi et du soutien social dans le maintien des filles dans les filières scientifiques, même dans des contextes où elles sont encore peu nombreuses.

Bien que nos résultats soient intéressants, ils présentent quelques limites. Les corrélations trouvées ne permettent pas de dire qu'un facteur cause directement la persistance. L'échantillon est aussi assez petit (72 étudiantes), ce qui limite la possibilité de généraliser les résultats. De plus, les réponses viennent d'un questionnaire, donc il peut y avoir un biais : Il se peut que les étudiantes aient cherché à fournir des « bonnes réponses ». Ensuite, les motivations ont été classées en 2 groupes (intrinsèques et extrinsèques), ce qui semble trop simplifier la réalité. En effet, les chercheurs récents (Deci et Ryan, 2020) montrent que les motivations sont souvent mélangées. Le contexte culturel n'a pas été assez pris en compte. Par exemple, la vision de l'autonomie

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ou de l'ambition peut varier selon la culture. De plus, la recherche parle peu des obstacles extérieurs comme le sexisme, le manque de moyens ou les pressions sociales (HCE, 2024). Ces éléments ont pourtant un impact important sur les choix scolaires. Enfin, on ne tient pas compte des différences entre les filles selon leur origine sociale ou géographique. Cela limite l'analyse. Malgré tout, cette recherche reste utile pour mieux comprendre la situation actuelle. Elle pose de bonnes bases pour d'autres travaux sur les filles dans les STIM.

Cette étude soutient la théorie de l'auto – efficacité de Bandura (2007). Elle montre que les étudiantes qui croient en leurs capacités ont plus de chances de continuer leurs études dans les STIM. L'ambition, la persévérance et la résilience sont des signes forts de cette auto – efficacité. Ces qualités les aident à affronter les défis. Celles qui croient en elles ne se découragent pas facilement. En parallèle, les résultats rejoignent la théorie de l'estime de soi de Branden et Archibald (1982). Cette théorie dit que les personnes qui se sentent compétentes et dignes réussissent mieux. Ici, les étudiantes qui sont motivées par leur propre volonté montrent une bonne estime d'elles – mêmes. Elles pensent qu'elles ont de la valeur et qu'elles méritent de réussir. Cela les pousse à continuer malgré les obstacles. Cette recherche montre que la réussite scolaire ne dépend pas seulement des conditions matérielles, mais aussi de la manière dont les étudiantes se perçoivent. Elle promeut des facteurs internes comme la confiance en soi et la motivation. Ces résultats confirment que les théories de Bandura et, de Branden et Archibald sont utiles pour comprendre le parcours des filles dans les STIM. Cette étude leur donne un nouveau sens dans le contexte africain, où les étudiantes doivent souvent affirmer leur place dans des filières difficiles.

Cette investigation aide à comprendre comment l'estime de soi influence le parcours des filles en filières d'ingénierie, en particulier à l'ENSAI où leur présence reste minoritaire mais significative. Cette dynamique est corroborée par les travaux récents de Smith (2024) démontrant que l'estime de soi agit comme un levier essentiel pour la persévérance des étudiantes en disciplines STEM. Par son impact sur la résilience, il les aide à surmonter les obstacles liés aux stéréotypes de genre et à s'affirmer dans des environnements traditionnellement masculins (Moore, 2024). De plus, selon l'étude de Francesconi (2025), la motivation intrinsèque, motivée par l'ambition personnelle et le désir d'autonomie, est un facteur qui encourage les étudiantes à s'investir pleinement dans leur cursus. Elle renforce ainsi leur sentiment de légitimité et leur besoin de reconnaissance sociale. Enfin, Dupras (2012) insiste sur l'importance des réseaux de soutien et des conseils avisés, qui nourrissent l'estime de soi et favorisent un engagement durable. En ingénierie, ils permettent aux étudiantes de se percevoir non seulement comme compétentes, mais également comme des professionnelles à part entière. Ces recherches démontrent que l'estime de soi ne se limite pas à la dimension académique, mais constitue un véritable moteur d'émancipation et de résistance aux normes genrées. Elles confirment ainsi la pertinence de cette étude pour comprendre comment les filles s'imposent dans des filières où elles sont souvent marginalisées.

Conclusion

Une importance de cette recherche réside dans le fait qu'elle aide à mieux comprendre pourquoi certaines filles réussissent à rester dans les filières STIM. Elle montre que leur persévérance dépend de plusieurs facteurs comme l'ambition, la confiance en soi, la motivation et le soutien de leur entourage. Dans des écoles comme l'ENSAI de Ngaoundéré, où les filles sont peu nombreuses, ces résultats sont très utiles. Ils montrent que malgré les obstacles, certaines étudiantes arrivent à avancer grâce à leur volonté et à leur motivation personnelle. La recherche met aussi en lumière l'importance de l'autonomie, de l'intérêt pour les matières étudiées et du soutien des parents ou des enseignants. Elle permet de mieux connaître les besoins spécifiques des filles dans les filières scientifiques. Elle montre aussi que les théories internationales sur la motivation ou l'estime de soi s'appliquent bien dans le contexte africain. C'est donc une étude utile à la fois sur le plan pratique et théorique. Elle aide les chercheurs, les enseignants et les décideurs à mieux comprendre ce qui pousse une étudiante à persister. Elle peut aussi inspirer des actions concrètes pour encourager plus de filles à s'inscrire en STIM. En résumé, cette étude montre que la réussite des filles en STIM ne dépend pas seulement des compétences, mais aussi de leur environnement et de leur confiance personnelle.

Les résultats permettent de proposer plusieurs actions concrètes. Les responsables politiques doivent encourager les filles à s'orienter vers les filières STIM. Il est important de valoriser les femmes scientifiques comme modèles. Des bourses, des stages et des campagnes d'information peuvent aussi aider. Les écoles STIM doivent offrir un environnement accueillant. Les enseignants doivent être formés pour soutenir les filles et valoriser leur travail en évitant les stéréotypes. Des clubs scientifiques qui leur sont réservés peuvent renforcer leur confiance. De même, le mentorat et les activités en groupe sont aussi utiles. Les parents ont également des rôles : soutenir les choix de leurs filles et les encourager, leur parler de leurs projets et de leurs envies. Leur soutien moral et affectif est important. Enfin, ces actions demandent à être coordonnées. C'est en unissant les efforts de l'État, des écoles et des familles qu'on pourra augmenter la présence des filles dans les sciences et assurer leur réussite.

Cette étude a posé les bases pour comprendre la persistance des filles dans les STIM, mais d'autres recherches sont encore nécessaires. D'abord, il

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serait utile d'élargir l'échantillon à d'autres Écoles d'ingénieur ou Universités africaines pour voir si les résultats sont les mêmes. Une comparaison entre différents pays ou régions pourrait aussi enrichir les analyses. Ensuite, il faudrait étudier les étudiantes sur plusieurs années, pour mieux comprendre comment leur motivation évolue au fil du temps. Une étude longitudinale permettrait de suivre les mêmes personnes et de voir les changements dans leur parcours. Il serait aussi intéressant d'inclure d'autres variables comme les conditions économiques, le niveau de soutien scolaire, ou encore l'accès à la technologie. Ces facteurs peuvent aussi influencer la persistance des étudiantes. Par ailleurs, on pourrait explorer le point de vue des enseignants, des familles ou même des garçons, pour mieux comprendre les dynamiques globales dans les classes STIM. Enfin, il serait utile d'analyser les stratégies concrètes mises en place par les étudiantes pour surmonter les obstacles. Ces recherches futures pourraient aider à créer des programmes adaptés aux besoins réels des étudiantes. Elles permettront aussi de mieux orienter les politiques éducatives en Afrique et d'offrir à chaque fille une chance de réussir dans les sciences.

Cette recherche montre que la réussite des filles en STIM dépend autant de facteurs psychologiques et sociaux que de leurs compétences scolaires. Il est essentiel qu'elles croient en elles, soient soutenues, aient un projet clair et évoluent dans un environnement inclusif. Les écoles, familles et décideurs doivent coopérer pour renforcer leur confiance, adapter les méthodes pédagogiques et valoriser les modèles féminins de réussite. En effet, en France par exemple, le rapport du Ministère de l'Enseignement supérieur (2025) et la note de 2024 de la Direction de l'Évaluation, de la Prospective et de la Performance (DEPP*)* montrent que l'influence des stéréotypes de genre et du manque de confiance en soi poussent les jeunes filles à s'autocensurer. Malgré de bons résultats, elles ont une perception de leurs capacités inférieure à celle des garçons. Ce manque de confiance, renforcé par les représentations sociales, est un obstacle à leur orientation et à leur persévérance dans ces filières. Ces travaux plaident pour des interventions ciblées sur ces facteurs non académiques, en plus des mesures purement éducatives. L'étude invite à voir les filles comme des actrices de leur avenir, capables de faire des choix ambitieux dans un domaine encore perçu comme masculin.

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Factors of PONASI Ecological Complex Resource Degradation

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Abstract

PONASI is an ecological complex which is located in the southern part of Burkina Faso. It abounds with fauna and floristic species. But these resources are in a phase of degradation. The aim of this study is to analyze the main factors contributing to the degradation of the PONASI ecological complex. In order to assess the degradation factors, a systematic approach was used. It is an approach that takes into account the various phenomena responsible for degradation and the interactions. Data collection techniques focused on documentary research, interviews, field surveys, the use of the snowball sampling method, and the processing of some climatic parameters. For this research, a total of twelve (12) villages were surveyed. The results showed that anthropogenic and climatic factors contribute to the degradation of the resources of the PONASI ecological complex. The anthropogenic factors consist of vegetation fires, wood cutting, grazing, and picking immature fruit, and agricultural encroachment. These factors are exacerbated by the limits of governance which result in a lack of legal texts' application, a weak appropriation of the decentralization policy by the local authorities. The results of this study have demonstrated that there are a multitude of factors that contribute to the degradation of the PONASI ecological complex. It is urgent to take the necessary measures to reverse this trend of degradation.

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Keywords: Governance, factor, degradation, decentralization, Burkina Faso

Introduction

In Burkina Faso, the forest domain consists of seventy-seven (77) classified areas, including sixty-five (65) classified forests. Within these classified forests, there are several factors of anthropization of classified forests, the most important factor of which is agricultural exploitation, followed by the construction of socio-economic infrastructure. This phenomenon is observed in more than 50% of classified forests. In addition to this illegal activity, there are also climatic conditions, green wood cutting, vegetation fires, overgrazing, and poaching, which contribute to a degradation of classified forests at 71 to 77% (MECV, 2007).

PONASI ecological complex is part of the Burkina Faso forest domain. It is located in the south-central region of Burkina Faso. It is made up of five large ecological entities, which are National Kaboré Tambi National Parc, Nazinga wild game ranch, the classified forest of Sissili, two corridors and 11 village areas of hunting interest. The Nazinga wild game ranch and the classified forest of Sissili are located in the Central-South of Burkina Faso, on the border of Ghana between the cities of Po in the East and Leo in the west. The map below (fig. 1) shows the five important ecological parts of the complex.

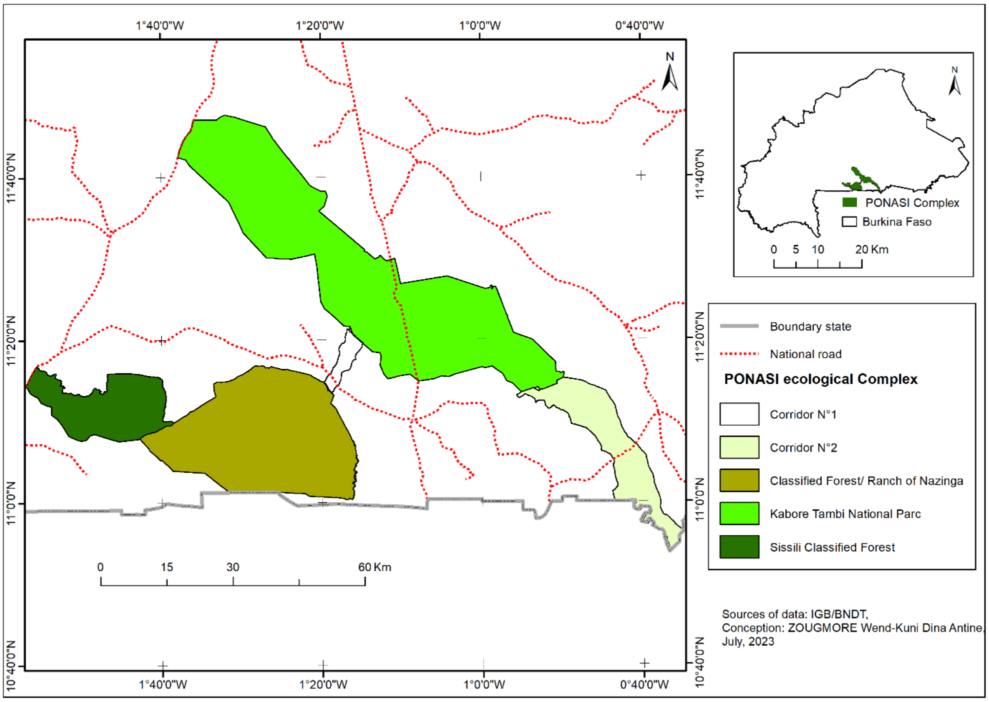

Fig 1: PONASI ecological main entities

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It straddles three regions of Burkina Faso and it constitutes a reservoir of diversity of animal and plant species.

Burkina Faso's main natural resources are land, water, forestry, wildlife, fisheries, pastoral and mining resources (MECV, 2005). But these resources are in a state of advanced degradation. The causes are mainly anthropogenic (MECV, 2005; MEEVCC, 2020).

Protected areas are the cornerstones of conservation efforts to mitigate anthropogenic pressures leading to biodiversity loss. They undergo rapid modifications. As an example, the study on the resistance capacity to habitat loss of 160,000 protected areas revealed that between 2003 and 2019, 1.14 million km^2 of habitat in 73% of protected areas were modified (Li *et al.,*2024).

The aim of this study is to analyze the factors linked to resource degradation in the PONASI ecological complex.

Its statutes, although different, give it different but complementary modes of operation. In order to help reverse the degradation trend, this study opted for a methodological approach based on a systemic approach.

Materials and Methods

The systemic approach

The methodology used in this study was based on the systemic approach. It is a method that takes into account all biophysical and human components and their interactions (Dipama, 2011). This approach has been relayed by techniques and tools for collecting and processing data related to surveys and spatial analysis (Kaboré and Dipama, 2014). It has been applied in this study because it takes into account the interconnection between biophysical parameters such as rainfall and temperature (Dipama, 2014).

It is an approach based on epistemology and a transdisciplinary methodology that is based on the concept of a system. This system represents a set of elements with enough interrelationships to form a relatively coherent and homogeneous whole.

This study supposes that there are several factors, including the mode of governance, climate, population growth, and anthropogenic factors that are responsible for forest dynamics, and these factors interact with each other. This justifies the adoption of the systems approach to analyze the interconnections between several factors to explain the causes of this degradation. The analysis of the factors that are at the origin of the dynamics of forest resources was made over a period of thirty (30) years.

Sampling methods

For this research, a total of twelve (12) villages were surveyed. In the urban municipality of Po, the villages of Bourou, Tiakané and Yaro were

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surveyed. In Guiaro, which is a rural municipality, the survey was conducted in Kollo, Oualem and Saro. In the urban municipality of Sapouy, the study was undertaken at Baouiga, Gallo and Tiakouré. In the rural municipality of Nobéré, the survey was carried out in the villages of Seloghin, Soulougré and Tamsé.

In each village, 10% of households were surveyed, totalling 228 households surveyed using the snowball method.
The interviews were held at municipal, departmental, regional and national levels with the administrative authorities and local elected authorities.

- **Interview guides**

The interview guides were used to conduct individual interviews with the stakeholders involved in the governance of the PONASI forest resources of the ecological complex at the national, regional, communal and village levels.

- **The questionnaires**

Questionnaires were sent to the sample of people interviewed in twelve (12) villages bordering the ecological complex PONASI. To carry out this study, surveys were carried out in two urban and rural municipalities adjacent to the ecological complex PONASI.

Data processing tools

- The Excel 2016 software: This software was mainly used in the processing of statistical data and the design of some graphs.
- Sphinx V5 software was used to process the qualitative data collected during the survey.
- QGIS 2.18 software was used to design the map.

The Results

The results of this research reveal that there are direct and indirect factors that are responsible for the degradation and deforestation of PONASI'S forest resources.

Several anthropogenic indices were observed through many surveys on different dates. These include farms, footprints of cattle, direct contact with livestock, facilities and the presence of basic infrastructure (health centres, schools, drinking fountains, cabins or houses, trails), pedestrian tracks, bicycle tracks and other gear (NatuDev, 2018; Bouché, 2005).

Anthropogenic factors

Wildlife and floristic species are now threatened by the persistence of constraints such as poaching, overgrazing, degradation of wildlife habitat by wildfires and the collection of building materials (sand, gravel, stubble, etc.), cutting wood for construction and firewood (MECV-PAGEN, 2006). Rural activities such as vegetation fires, agriculture, pastoralism, and hunting are

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also sources of degradation of natural resources (Dipama, 2011). Five (5) signs of poaching were observed, including one identified poacher and the remains of a dead elephant, dug holes and dog tracks (NatuDev, 2018).

Vegetation fires

According to 80% of the surveyed households bordering the ecological complex PONASI, vegetation fires are the primary factor in the degradation of forest resources. According to them, the fire is often caused by breeders to facilitate the regrowth of young herbs. Poachers often use this practice to remove small game from their habitat. These fires reduce the capacity of the production of non-timber forest products. This is also exacerbated by the level of competition between humans and wildlife for the use of these same products. Several indications of poaching have been observed in Corridor N°1. These include contact with poachers, animal carcass remains, and dog tracks (NatuDev, 2018). The photo below is an illustrative photo of the presence of vegetation fires within the complex (fig. 2).

Fig.2 : Traces of fire passage within the Nazinga wild game ranch in the part that borders the village areas of hunting interest of Koumbili. Photo credit: ZOUGMORE Wend-kuni Dina Antine April, 2019

Wood cutting

Cuts and piles of wood were observed in some places, especially in the south of the site . Some coal piles were observed in the north and south of the site.

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Fig. 3 Wood Cutting at Kaboré Tambi National Park and Nazinga wild game ranch. Photo credit: ZOUGMORE W. Dina Antine

Figure 3 shows a karitier tree (*Vitelaria paradoxa*) that has been cut down. Beyond this, there is the cutting of green wood, which is strictly prohibited within the limits of protected areas, but these forbidden practices are observed and are very common within the complex protected areas. 19 signs of natural resource exploitation were recorded, including tree felling and the presence of charcoal pits. Each of these phenomena was observed seven (7) times, representing a percentage of 37% for each offence.

Grazing and picking immature fruit

The PONASI complex is faced with a strong presence of livestock within it. The inventory carried out by NatuDev (2018) revealed the presence of livestock in the corridor. 107 signs of encroachment have been observed (fields, livestock contact, presence of tracks) and 28 traces of livestock have been recorded. This represents 26% of the encroachment signs.

The presence of these livestock in these ecological entities creates competition between them and wild animals for the use of non-timber forest products. The riparian population that also exploits these same resources contributes to exacerbating this competition. According to 40% of the households surveyed, harvesting immature non-timber forest products is the third most important offence.

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Fig. 4. Cattle herd in Corridor N°1. Photo credit: ZOUGMORE W. Dina Antine June, 2020

Figure 4 illustrates the presence of livestock in the Corridor N°1.

According to the breeders, the complex is a favourable area for grazing activities. Land pressures are very strong outside the PONASI ecological complex, and this does not allow them to graze their herds outside the complex. Also, this choice allows them to avoid conflicts with farmers, especially during the rainy season.

The agricultural encroachment

The boundaries of Corridor N°1 are adjacent to several agricultural fields. Large areas of village and hunting interest are being converted to agricultural land. This poses significant threats to the conservation of key ecological entities such as the Kaboré Tambi National Park and the Nazinga wild game ranch.

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Fig. 5. Proximity between corridor N°1 and the field

Photo credit: ZOUGMORE W. Dina Antine, April, 2020

Fig. 6. Proximity of Nazinga wild game ranch boundaries to a field

Photo credit: ZOUGMORE W. Dina Antine, April, 2020

Figures 5 and 6 show the agricultural pressure on some entities of the protected areas.

The photo in fig. 5 was taken on the Po-Guiaro axis. To the right, the limit of corridor N°1can be seen, and to the left, the limit of an agricultural crops field.

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Figure 6 was taken between the borders of the Nazinga wild game ranch and the village areas of hunting interest of Koumbili, part of which has been reconverted to the benefit of cultural practices. On the left and right are the Nazinga wild game ranch and the village areas of hunting interest of Koumbili, respectively. The inventory conducted by NatuDev (2018) provided figures on encroachment in the Corridor. This study revealed the presence of human activity in this ecological entity. Of the 107 signs of encroachment observed (fields, livestock contact, presence of tracks), 58 traces of human presence (farms, footprints or bicycle tracks, human installations) were recorded. This represents 54% of the encroachment signs.

These pressures are quite widespread between the Nazinga wild game ranch, the corridor and the village areas of hunting interest. These photos serve as an illustration of the land pressures facing the PONASI ecological complex. This calls for urgent measures to be taken for the conservation of the boundaries of the PONASI ecological complex.

Climate Factors

Rainfall and temperature are two main parameters for analysing changes in climate conditions over time (Ouédraogo, 2012; Karambiri, 2017). But temperature is the most sensitive parameter in the assessment of the climate. It is the one that influences the evolution of vegetation. They are also the climatic parameters whose dynamics are easily discernible by the population (Dipama, 2014). For the analysis of some climatic parameters, the data of the synoptic scale were retained for several reasons.

Rainfall trends 1993 to 2023

The Standardised Rainfall Index (SRI) and the shadow thermal diagram are tools for characterizing rainfall (Ouédraogo, 2012; Karambiri, 2017).

- **Standardized Rainfall Index (SRI) of Po synoptic station from 1993 to 2023**

The SPI highlights inter-annual variability and rainfall trends by distinguishing the rainy season's surplus and deficit. The surplus and deficit rainy seasons are above and below axis 0, respectively.

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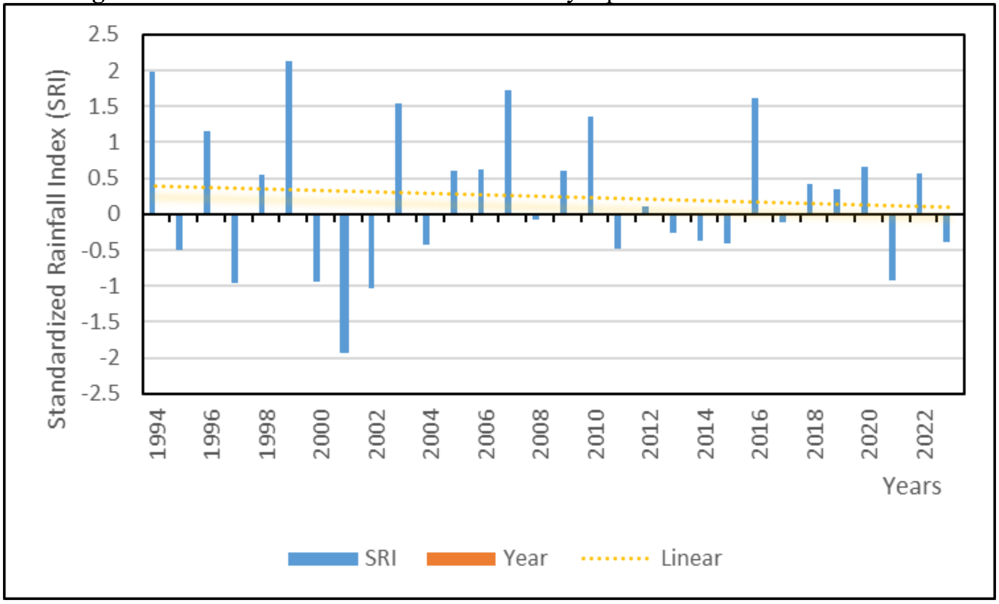
Fig. 7: Standardized Rainfall Index of the Po synoptic station from 1994 to 2023



Data Sources: National Meteorological Agency of Burkina Faso, 2023

Figure 7 shows the rainfall trends of the Po synoptic station from 1994 to 2023.

The SRI highlights inter-annual variability and rainfall trends by distinguishing the rainy seasons' surplus and deficit. This figure shows the rainfall trends of the Po synoptic station from 1994 to 2023. The bars above axis 0 represent positive SRI values and reflect years of rainfall surpluses. However, the bars below axis 0 are negative SRI values and correspond to years of poor rainfall. The analysis of this figure shows a succession of years of excess and deficit rainfall. First, from 1994 to 1999, the years of excess and deficit rainfall alternate with a continuation of the rainfall deficit over a period of two successive years from 2000 to 2003. From 2004 to 2023, the alternation of years of excess and deficit rainfall was confirmed with a succession ranging from two to three years in a row.

1999 was the year with the largest rainfall surplus and 2001 the year with the largest rainfall deficit. The trend curve is almost confused with axis 0 and is almost stationary. This reflects the fairly frequent succession and the equal number of years of excess and deficit rainfall.

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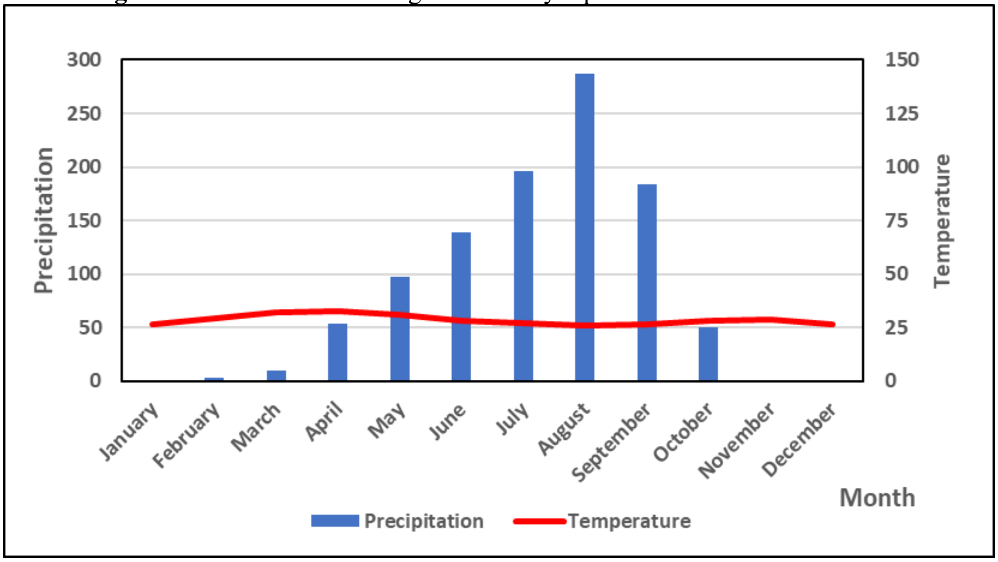
The Storm-Thermal Diagram

The dry season can be determined by defining the dry month, which corresponds to the month in which the monthly sum of precipitation in millimetres is less than or equal to twice the monthly average temperature in degrees centigrade. The formula is P < 2T, which allows to draw up BAGNOULS and GAUSSEN thermal shading diagrams.
In this type of diagram, the dry month is considered.

Fig. 3: The storm-thermal diagram of Po synoptic station from 1994 to 2023



Data Sources: National Meteorological Agency of Burkina Faso, 2023

Figure 3 indicates that the months of January, February, March, April, October, November, and December are dry months. Therefore, it can be deduced that during the period of 1994 to 2023, the dry season generally lasted for a period of seven (7) months on the area which is covered by the Po synoptic station. On the other hand, the rainy months are those of May, June, July, August, and September. Therefore, the rainy season is shorter than the dry season.

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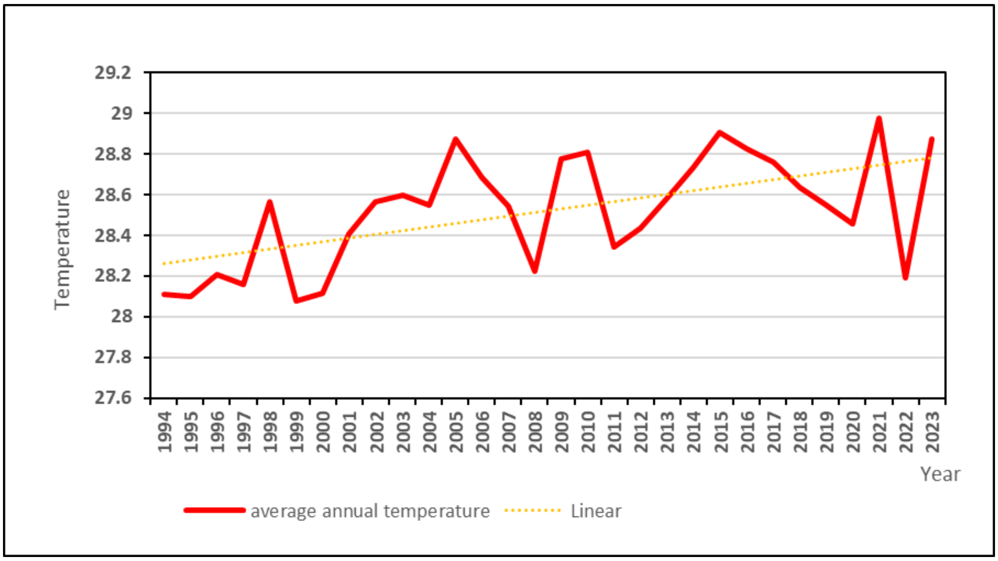
Temperature

Fig. 4: Annual average evolution of temperatures of the Po synoptic station from 1994 to 2023



Data Sources: National Meteorological Agency, 2023

The curve has been plotted using data from the monthly average temperatures of the Po synoptic station from 1994 to 2023. It reflects a fairly large increase in inter-annual variability. The trend line confirms this because its growth is continuous throughout the analysis period. In 1989, the trend line indicates that the annual average temperature value is between 28, 0 and 28, 1°C. It continued to oscillate and reached almost 28,8 in 2018. This upward trend in temperature contributes to the wilting of vegetation (Dipama, 2014).

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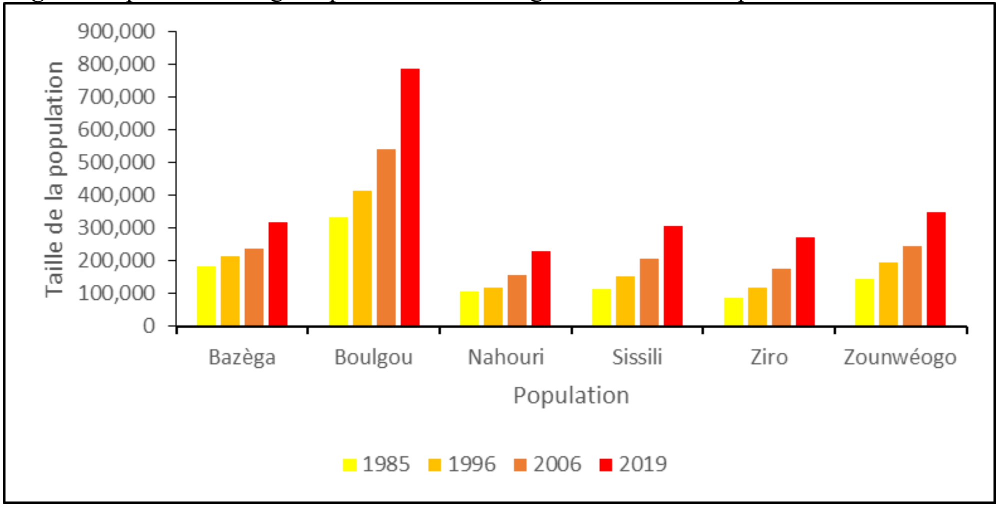
Demographic factors

Fig. 10. Population change in provinces bordering the PONASI complex from 1985 to 2019



Sources of data: INSD 1985, 1996, 2006, 2019

Figure 10 summarizes the population growth of the six (6) provinces bordering the PONASI ecological complex between 1985 and 2019.

Figure 10 shows that the population sizes of the six 6 provinces bordering the PONASI ecological complex increased steadily from 1985 to 2019. On average, the size of these populations has doubled in some areas. This is explained by the convergence of the mass of migrants towards these areas. They are looking for agricultural land. In fact, non-native populations who are looking for better living conditions are the main actors responsible for the change in land use. They switch from subsistence agriculture to cash crop farming in order to increase their income. These new behaviours contribute significantly to the emergence of new areas occupied by plant formations.

Discussion

Factors of natural resource degradation can be categorized as direct (proximate) and indirect (underlying) factors (Arouna, 2012; Geist and Lambin, 2002). According to Mengistu and Woldetsedik (2018), changes in land use are caused by a synergy of factors at different levels. The interactions between proximate and underlying factors are complex (Geist and Lambin, 2002). Direct factors are those whose effects directly contribute to the degradation of plant resources. They include agriculture and charcoal production (Odum, 2024). The indirect causes, which operate at a much wider scale are boost the direct causes (Geist and Lambin, 2002). Indirect factors influence direct factors and contribute to intensifying them (Brun *et al.,* 2020). This study highlighted three main factors of degradation and deforestation

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within the PONASI ecological complex, namely anthropogenic, climatic, and demographic factors.

The investigations carried out have revealed that vegetation fires, excessive logging, harvesting of immature fruits and grazing are the anthropogenic causes that degrade the resources of the PONASI ecological complex. Grazing poses a threat to the protection of biodiversity. The successive practices of agriculture and grazing contribute to soil erosion. This is a factor that limits natural regeneration. Inventory work conducted as part of the PAGEN project also confirms the presence of active fires and late burns in the Kaboré Tambi National Park (Bouché, 2005). Anthropogenic factors are part of direct factors. Several authors also concluded from the results of their research that these factors contribute to reducing the potential of protected areas. In fact, Mchedluri *et al.* (2024), have confirmed that grazing leads to direct and indirect effects on the conservation of natural habitats and promotes the migration of species towards better-adapted ecosystems. Kaboré and Dipama (2014), through their research, have also proven that pastoral practices are unfavourable to the conservation of plant resources. In fact, there is increasing pressure due to the large number of livestock. This is a source of overexploitation of plant resources and the induration of plant soils. The findings of Li *et al.* (2024) corroborate the results of this study. According to them, protected areas prove to be vulnerable in the face of increased agricultural land, grazing and urbanization. These factors contribute to the destruction of natural habitats in these entities.

This study also raised that climatic factors are also a part of the causes that degrade the resources of the PONASI ecological complex.

These results are also corroborated by many authors. According to them, climate change negatively influences forestry production through variations in bioclimatic factors. The rising level of CO_2 in the air contributes to the increase in gross photosynthesis and biomass. But rising of temperatures and reduced rainfall levels or even increased drought can be a barrier to the harmonious development of tropical forests (Bernard, 2010). Climate change can be a barrier to the harmonious development of trees in the forest. It could manifest itself in increased drought waves, floods, variations in temperature of rainfall quantities and durations (Dipama *et al.,* 2011). Rainfall deficits and their unequal distribution have negative consequences on the evolution of natural vegetation (Bernard, 2010).

The variation in temperature is felt by the population through increased heat, dust winds, destruction of vegetation cover, reduced soil fertility, and early river drying-up (Dipama *et al.,* 2011).

Climate influences the distribution of animal and floristic species. Climate variability may be a factor that harms the ability of protected areas to provide the necessary conditions and be appropriate for species conservation

(Deshaies, 2014). They contribute to the degradation of plant and wildlife resources (Dipama, 2016).

In addition to the anthropogenic and climatic factors, the demographic factors are also responsible for the degradation of the protected areas. The results show that the population has doubled in some areas from 1985 to 2019. The growth of the population increases the demand for protected areas' resources. Population growth leads to increased demand for farmland. The shift from subsistence to cash crops has resulted in an increase in the area planted. This exacerbates land pressure and contributes to the degradation of plant resources. This result is corroborated (Dipama, 2016; Bouko *et al.,* 2007).

Indirect factors can include political, institutional, and technological factors (Odum, 2024).

The indirect factors of deforestation and forest degradation promote the appearance of one or more direct factors (Geist and Lambin, 2002). They can be summarized as the constant increase of a poor rural population, the lack of actors' capacity and land use planning tools, the low level of capitalization of good forestry practices, and difficulties in applying the legal and regulatory frameworks of the forestry sector.

Decentralization is very limited in terms of the transfer of authority, management power and powers from the central government to local communities and the current implementation of decentralization does not allow local communities to effectively take over the management of natural resources. The result concerning the weak appropriation of the decentralization policy by the local authorities are in line with those obtained by Dipama (2011). Also, the limits of governance and the lack of enforcement of laws contribute to illegal exploitation of forest resources. This has been confirmed by Bérenger *et al. (*2015). The effective involvement of local and regional authorities in the management of forest resources is confronted with the lack of effective transfer of responsibilities for the management of natural resources from the State to local and regional authorities. Anticipatory measures are poorly taken by municipalities because they are poorly equipped in terms of human, financial and material resources. Unclear property and resource rights are causes of deforestation and degradation. Clear and secure tenure is necessary to make some investment in forestry and create better conditions to make decisions for forest protection. These results are corroborated by Dipama (2011) and Siry *et al.* (2015). According to Mengistu and Woldetsedik (2018), for the sustainable development of land resources, it is essential to take action to minimise the effects of changes in land use. To limit agricultural encroachment, it is necessary to secure the boundaries of this ecological complex at the legal level and by increasing the level of surveillance. It would also be beneficial to enhance the level of consultation

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among the different actors who gravitate around the complex. For the sustainability of this ecological entity, income-generating activities must be diversified in order to prevent the population from rushing to this complex to meet their subsistence needs. This will reduce factors contributing to degradation, such as agricultural encroachments, poaching, and cutting of green wood. For instance, the diversification of income-generating activities can be achieved through the construction of dams to boost off-season activities. This is in accordance with the recommendations made by the authors Li *et al.* (2024), who say that each protected area may have specific weaknesses. Therefore, the management must be adapted to the different pressures in order to mitigate them. Protected areas must be drivers of sustainable development while maintaining their conservation capabilities.

Conclusion

Climate, vegetation, and man are important elements of the environmental system. Spatial-temporal changes in vegetation can be explained by several direct and indirect factors.

The management of protected areas faces political, human, financial, institutional, legal, regulator,y and communication challenges among local residents.

The results of this study have demonstrated that there are a multitude of factors that contribute to the degradation of the PONASI ecological complex. These factors are essentially vegetation fires, wood cutting, grazing, agriculture encroachment, climate, demographic and political factors. Indirect factors such as political factors, population growth and climate change contribute to increasing the intensity of degradation caused by direct factors. Also, the limits of governance and the lack of enforcement of laws contribute to illegal exploitation of resources. Therefore, it is urgent to take the necessary measures accordingly to the different pressures to reverse this trend of degradation.

To limit the factors of degradation, it is necessary to secure the boundaries and enhance the level of consultation among the different actors who gravitate around the complex. In order to promote better conservation of the complex's resources, it would be advisable to diversify the income-generating activities around the complex. It emerges from the interviews with officials of the local authorities that it is necessary to clarify the roles and responsibilities of each stakeholder in the management of the PONASI ecological complex.

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Dynamiques de l’occupation du sol et du ravinement dans le bassin versant d’un petit affluent du fleuve Niger : kori Ganguel (sud-ouest Niger)

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Résumé

L’érosion hydrique est un facteur majeur de la dégradation des milieux sableux au Niger. L’objectif de ce travail est de caractériser la dynamique environnementale sur le bassin de Ganguel. Il s’agit spécifiquement de déterminer les dynamiques de l’érosion hydrique, et de l’occupation des sols. La stratégie de ce travail a été basée sur une cartographie diachronique sous le logiciel ARCGIS et des calculs d’indice de l’agressivité climatique. Il ressort une augmentation du ravinement qui a été de 7 ravins/an entre 1989et 2015, un recul des berges de 7,71m /an entre 2002 et 2017, une augmentation moyenne de 4 noeuds/an entre 2002 et 2017. Une diminution de la végétation de 29% pour la période 1989-2015, une augmentation des surfaces nues et ou encroûtées de 2844 ha entre 1989 et 2015. L’érosivité des pluies à Ganguel entre 1970 et 2017 n’a pas montré une tendance claire et a été régulièrement modérée (100<RI<200). L’accroissement du ravinement a permis le développement de culture de type verger le long des chenaux. En effet la surface des vergers a connu une augmentation de 0,43% entre 2002 et 2015.

Mots clés : Érosion, occupation du sol, ravinement, kori, Ganguel, affluent

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Land use and gully dynamics in the watershed of a small tributary of the Niger River: kori Ganguel (southwest Niger)

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Abstract

Water erosion is a major factor in the degradation of sandy environments in Niger. The aim of this study is to characterize the environmental dynamics of the Ganguel basin. Specifically, the aim is to determine the dynamics of water erosion and land use. The strategy for this work was based on diachronic mapping using ARCGIS software and climatic aggressiveness index calculations. The results show an increase in gullying of 7 gullies/year between 1989 and 2015, bank recession of 7.71m/year between 2002 and 20017, and an average increase of 4 knots/year between 2002 and 2017. A 29% decrease in vegetation for the period 1989-2015, an increase in bare and or encrusted surfaces of 2844 ha between 1989 and 2015. Rainfall erosivity at Ganguel between 1970 and 2017 showed no clear trend and was consistently moderate (100<RI<200). Increased gullying has enabled the development of orchard-type crops along the channels. Indeed, the surface area of orchards increased by 0.43% between 2002 and 2015.

Keywords: Erosion, land use, gullying, kori, Ganguel, tributary

Introduction

Le Sahel, très sensible aux variations climatiques, est particulièrement marqué par la très forte variabilité des pluies (Sultan et al ,2015 ; Diallo, S et al, 2022 ; zokom, 2025) En effet, la variabilité des pluies est marquée par des sécheresses récurrentes qui ont été particulièrement sévères dans les décennies 1970 et 1980 (Abdourhamane Toure et al., 2017). Ces sècheresses se sont manifestées par la mort de millions d'arbres (Ambouta, 2007 ; Atta et al., 2010). L'effet de cette péjoration climatique a été accentué par la pression de l'homme. En effet, le Sahel est la région du monde qui a connu la plus forte augmentation de population ces dernières années (Garenne et al 2016). Ceci a conduit à une pression importante sur les ressources naturelles (Descroix et al., 2015). Au Niger, la forte croissance démographique (INS, 2022), s'est accompagnée par une forte demande en énergie et en champs de culture qui ont abouti à un déboisement intensif et une expansion des terres cultivées

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(Moussa Issaka, 2014 ; Idé et al., 2022 ; Tounkara A. et al. 2022). Ces pressions ont entrainé une modification des états de surfaces avec un accroissement des surfaces nues (Belem et al,2018 ; Issoufou Idé et al.,2022 ; Adamou et al 2022). Dans la région de Tillabéry, par exemple, Malam Abdou (2016) a mis en évidence une multiplication par 12 des surfaces nues entre 1986 et 2010 du fait de la dégradation de la broussaille et de la forte consommation en bois de chauffe. Cette dégradation de la végétation a favorisé l'emprise de l'érosion et l'ensablement des cours et plans d'eau (El hage hassan et al, 2018). En effet, 100.000 ha de terres sont perdus chaque année au Niger à cause entre-autres de l'érosion (PDS, 2022). Les particules des terres érodées sont charriées par divers cours d'eau pour provoquer en aval l'ensablement des plans d'eau et du fleuve Niger en particulier (ABN, 2016). Le kori Boubon a, par exemple, charrié près de 4.550.000 tonnes de sédiment en 2009 tandis que le kori gorou-kirey a charrié près de 5.000.000 tonnes de sédiments en 2009 vers le fleuve (Mamadou, 2009). La diminution du volume du fleuve Niger par ensablement est un facteur majeur des inondations enregistrées à Niamey (Maurizio Tiepolo, 2016). Au cours des dernières années, les inondations ont entrainé plusieurs morts et destructions de maisons dans l'arrondissement au Sahel (Ahouangan et al , 2014). Si le rôle des affluents majeurs en amont (Dargol, Goroual) est indéniable dans ces inondations récurrentes à Niamey, il est, cependant, important de déterminer le rôle des affluents de moindre envergure et proches de Niamey comme le kori Ganguel. Le présent travail a donc pour objectif de caractériser les dynamiques de l'occupation du sol et de l'érosion hydrique sur le bassin versant de Ganguel.

MATÉRIEL ET MÉTHODES

Site de l'étude

Le bassin versant du kori Ganguel est situé au sud-ouest de Niamey. Il couvre une superficie de 25874.47 ha et est situé entre 1°55'- 2°05'E et 13°25'13°32'N. Le bassin de ce tributaire du fleuve Niger est limité par des plateaux constitués de grès tandis que sa vallée est dominée par des versants sableux (figure1). Les cultures pluviales principalement celle du mil dominent sur les versants. Le sommet des plateaux est lui occupé par une brousse plus ou moins dégradée. Le bassin de Ganguel se trouve au Sahel central et reçoit entre juin et septembre en moyenne près de 500 mm de pluie par année.

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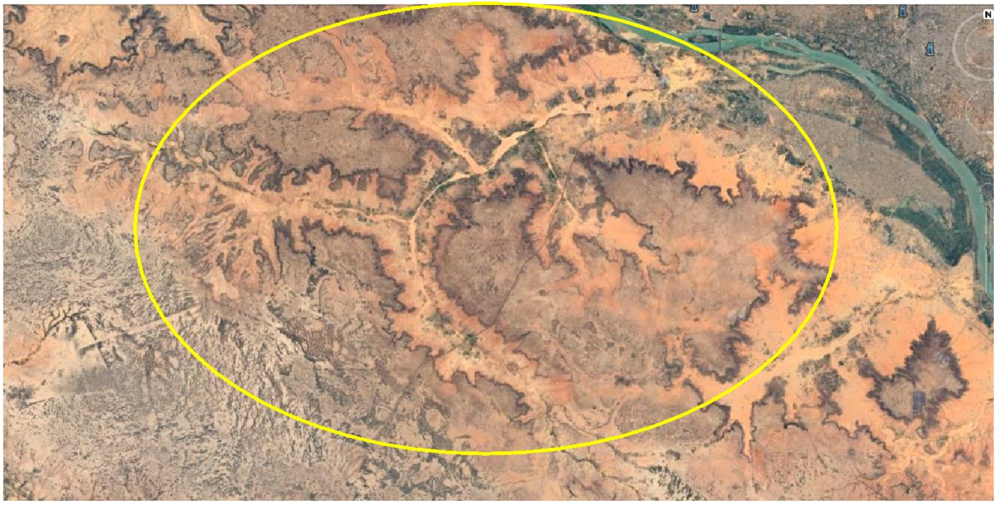

Figure 1 : Le bassin versant du kori Ganguel

Cartographie des unités paysagères et de l'occupation du sol

Elle a été réalisée avec l'utilisation de trois images Landsat de 1989, 2002, et 2015 suivant un pas de temps régulier de treize ans (figure 2). Les images ont été traitées sur Arc Gis 10.5 ©. Elles ont été au préalable géoréférencées dans le système de Mercator (GCS_WGS_84). Une classification semi-automatique de huit (8) unités paysagères et des occupations de sol a été réalisée pour chaque période en se servant de la nomenclature de l'occupation des sols de Niger (Ministère de l'environnement du Niger, 2010).

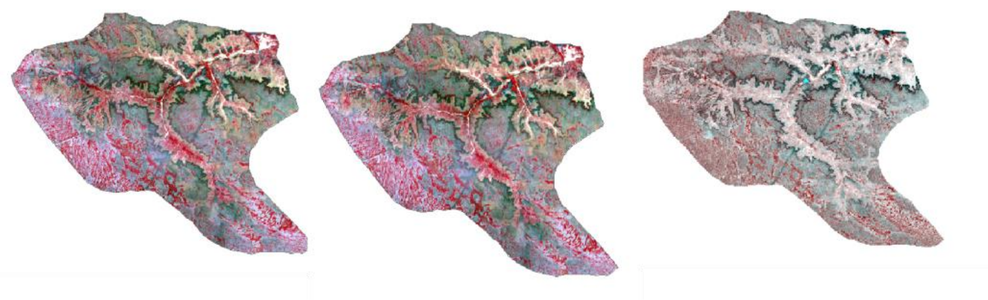

Figure 2 : Images Landsat du bassin versant Ganguel de 1989, 2002 et 2015

Cartographie de la dynamique du ravinement

Elle a été réalisée avec les images Google Earth des années 2002, 2008 et 2017 préalablement géoréférencées dans le système de Mercator (GCS_WGS_84). Cependant, du fait de la taille importante du bassin, la dynamique ravinaire a été uniquement suivie dans la partie médiane du bassin de Ganguel (1°55'- 2°05 - 13°25'-13°32) qui couvre 73,8 ha et qui a présenté

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une dynamique ravinaire plus importante. Ainsi, le chenal principal et les différents affluents ont été numérisés sous Arc Gis © 10.5. Les indices de l'érosion par ravinement qui ont été déterminés sur le bassin de Ganguel sont :

- la longueur totale et le nombre des affluents du chenal principal,
- la densité du ravinement (D) (équation 1).

$$D = \frac{\text{Longueur des ravins en km}}{\text{Superficie en km}^2}$$

Détermination de l'indice d'érosivité des pluies sur le bassin de Ganguel

Le ravinement est une conséquence entre le climat (pluie) et le sol (occupation des sols). L'agressivité climatique a été observée à travers l'indice d'érosivité des pluies de Fournier (1980). Cet indice permet aussi d'expliquer la dégradation spécifique des milieux africains (Andoh *et al.,* 2012 ; Meddi, 2013) et est bien corrélé avec les pertes en terre simulées par le modèle de l'érosion de Wishmeier et Smith (1958) (Roose, 1994 ; Vrieling, 2010). L'indice de Fournier a été déterminé en considérant la pluviométrie de tous les mois de l'année (équation 2). Il a été calculé en tenant compte de la pluviométrie enregistrée entre avril et septembre (saison des pluies) en lieu et place de la pluviosité annuelle de l'équation de Fournier (équation 3). Selon la valeur de l'indice de Fournier, l'érosivité des pluies peut varier de très faible à très élevé.

$$RI=1 \quad \sum(MR)^2/AR \quad (2)$$

RI: indice d'érosivité des pluies
MR: pluviométrie mensuelle en mm
AR : pluviométrie annuelle en mm

$$RI=1 \quad \sum(MR)^2/AR \quad (3)$$

RI: indice d'érosivité des pluies
MR: pluviométrie mensuelle entre avril et septembre en mm
AR : pluviométrie annuelle pour les mois d'avril à septembre en mm

Résultats et discussions

Variations d'unités d'occupation du sol

Elles ont été appréhendées grâce aux cartes réalisées avec les images Landsat de 1989, 2002 et 2015 (figures 3 et 4). Il ressort de l'étude des unités d'occupation des sols que les surfaces cultivées en mil occupent la plus grande

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partie du bassin de Ganguel (figures 3). Toutes les vallées sableuses et une bonne partie du sommet des plateaux ont été entièrement mises en culture avant 2015 (figure 3). De 1989 à 2015, les surfaces cultivées en mil ont augmentées en passant respectivement de 39,59% à 49,69 (figure 4). Cette augmentation faite au détriment de la végétation des plateaux a été plus marquée entre 1989 et 2002 où elle atteint en moyenne 0,64% par an soit huit fois l'accroissement moyen des surfaces cultivées (0,08% par an) entre 2002 et 2015. Une augmentation des surfaces cultivées a déjà été observée au cours des dernières décennies au sud-ouest du Niger. En effet, Leblanc et al (2008) ont mis en évidence une extension des surfaces cultivées entre 1950 et 1992. De même, à Saga Gorou, les surfaces cultivées ont connu une extension de près 48,7% entre 1950 et 1975 avant de diminuer entre 1975 et 2009 (Abdourhamane Touré et al., 2010).

La superficie de la végétation a baissé de manière continue dans le bassin du kori Ganguel entre 1989 et 2015. En effet, le pourcentage de recouvrement par la végétation des plateaux est passé de 21,40% en 1989 à 14,64% en 2015 (figures 3 et 4). Le taux de la baisse moyenne par an a été de 0,31% par an entre 2002 et 2015 soit près de deux fois plus importante que celui 1989 et 2002 (0,17% par an). La structure de la végétation a aussi varié sur les plateaux de Ganguel (figure 3) : elle est passée d'un aspect dense en 1989 et 2002 à un aspect clairsemé en 2015 où les surfaces nues occupent une proportion importante. La végétation subsiste encore sur les plateaux de Ganguel, ce qui n'est pas le cas des plateaux du terroir de Saga Gorou situé à 15 km à l'est de Niamey où les plateaux ont été complétement dénudés dès 1975 (Abdourhamane Touré et al., 2010). Aussi, sur les plateaux de Boubon, Souley Yéro (2008) a mis en évidence un recul voire une disparition de la végétation de la brousse tigrée entre 1950 et 2005. La baisse de la végétation à Ganguel est, cependant, continue entre 1989 et 2015 malgré une pluviométrie meilleure par rapport à la décennie précédente (figure 3).

Les vergers sont localisés le long des koris et sont dominés par des cultures de rentes (moringa, manguier, goyavier, citronnier, et des eucalyptus pour la production en bois). Entre 1989 et 2015, leur dynamique semble marquée par une évolution en cloche (figure 3) en passant de 1,09 ; 1,89 et 1,46% en 1989, 2002 et 2015 respectivement. Dans le complexe de Saga Gorou, les vergers et potagers ont connu une extension importante entre 1975 et 2009 du fait des valeurs marchandes des produits récoltées (Abdourhamane Touré et al., 2010). A Tibiri (région de Maradi), les superficies des vergers ont augmenté de plus de 1000ha entre 1972 et 2010 (Sadda et al., 2007 ; Dallahi et al 2021). Daouda et al., (2015) ont eux aussi mis en exergue un accroissement des surfaces des vergers qui sont passées de 32 ha en 1957 à 660ha en 2014.

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Les surfaces encroûtées étaient localisées au pied des talus où les pentes (3,3%) permettent à l'érosion de mieux s'exprimer. Elles ont connu une extension en passant de 10,39 ; 21,30 et 24,86% en 1989, 2002 et 2015 respectivement (figures 3 et 4). L'extension moyenne des surfaces encroutées entre 1989-2002 a été de 0,78%/an (0.02ha/an soit plus de trois fois celle de la période 2002 – 2015 où elle a été de 0,25%/an (0.006ha/an). L'extension de ces surfaces dégradées au détriment des surfaces cultivées et végétalisées a été particulièrement marquée sur les plateaux (figures 3 et 4) contrairement à Saga Gorou où elle a été plus intense au pied des plateaux (Abdourhamane Touré et al., 2010). Les surfaces encroûtées ont aussi augmenté dans le bassin versant du kori Boubon de 1,37ha entre 1965 et 2007 (Souley Yero, 2008).

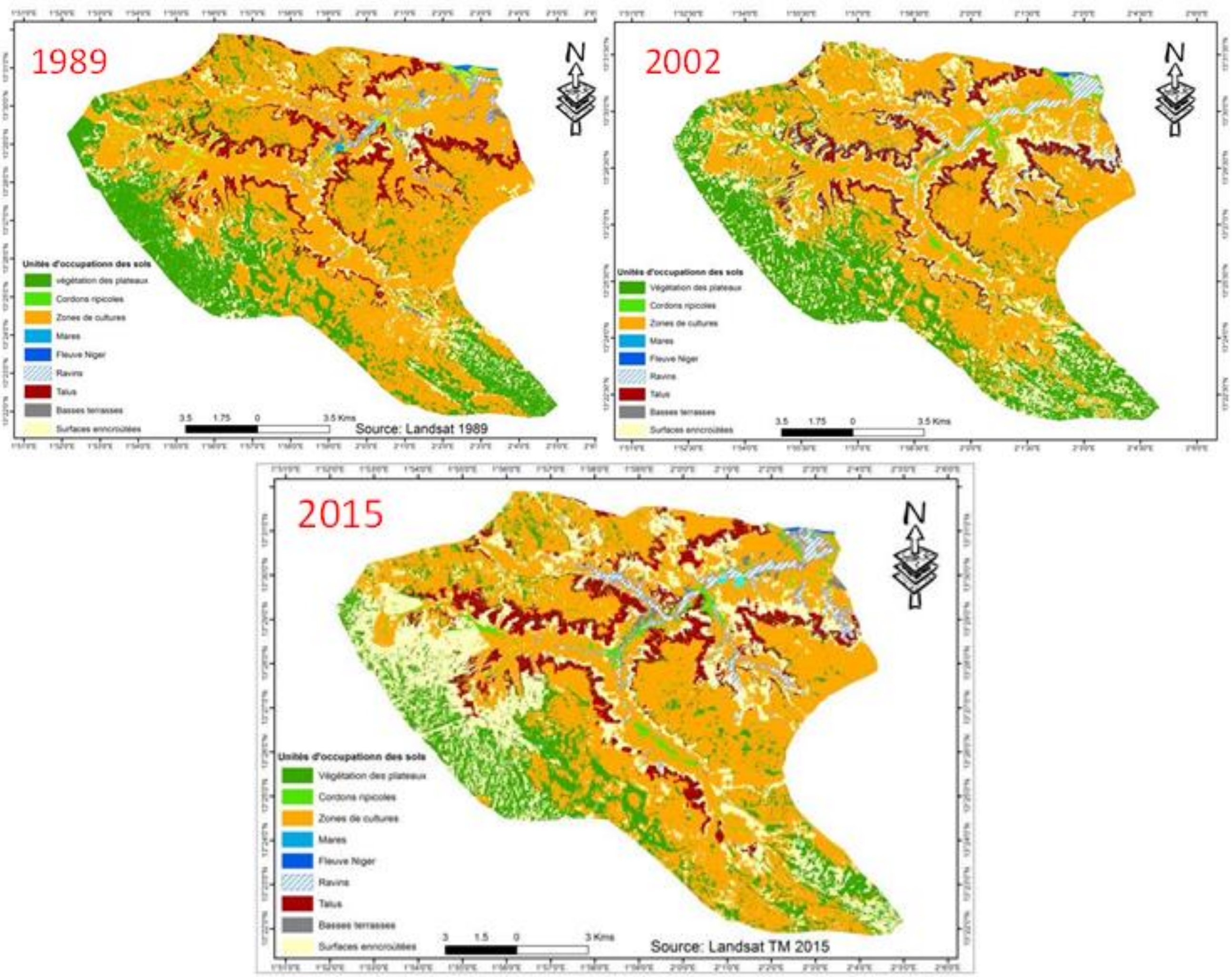

Figure 3 : Carte d'occupation des sols du bassin versant de Ganguel en 1989, 2002 et 2015.
Source : images Landsat de 1989, 2002, et 2015

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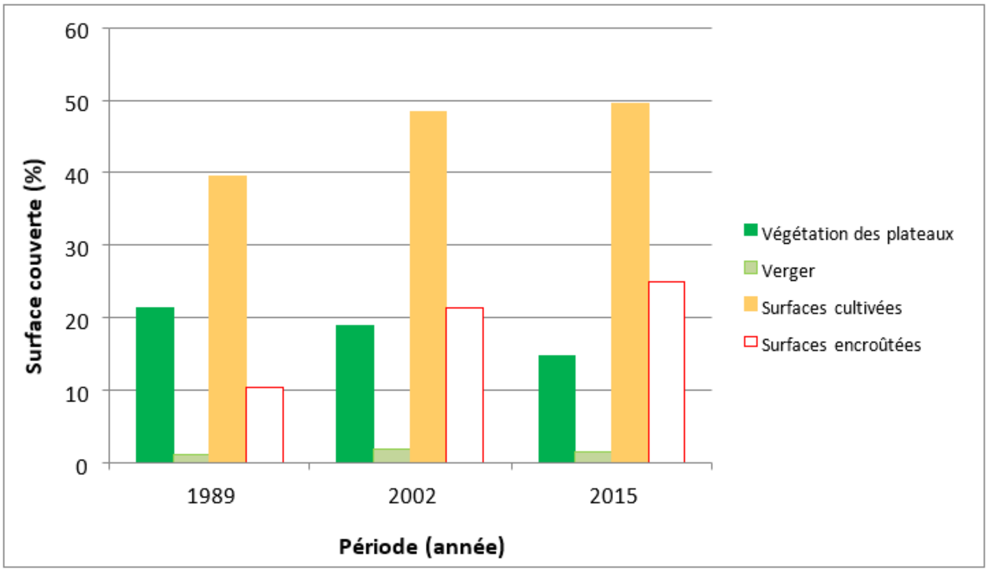

Figure 4 : L'évolution des unités paysagères et de l'occupation du sol

Variation de L'indice d'érosivité des pluies à Ganguel

L'érosivité des pluies a été très variable entre 1970 et 2017 (figure 5). L'indice d'érosivité de Fournier qui a oscillé entre 53 et 210 (figure 5) a mis en évidence une fluctuation de l'érosivité climatique. L'érosivité a, en effet, été faible, modéré voire élevé. Entre 1970 et 2017, l'érosivité des pluies à Niamey a été particulièrement modéré (100 <RI<200) dans 73% des années. L'érosivité est, cependant, devenue majoritairement faible (50 <RI<100) au début des années 1980. Durant la période 1970 à 2017, cette érosivité faible a représenté 23% des années. Seules deux années (1989 et 2012) soit 4% ont été marquées par des érosivité élevées (200 <RI<300). La variabilité interannuelle de l'agressivité des pluies a été observée aussi bien au Sahel qu'au Maghreb où elle a été liée à la variation interannuelle des pluies (Ide.I 2022).

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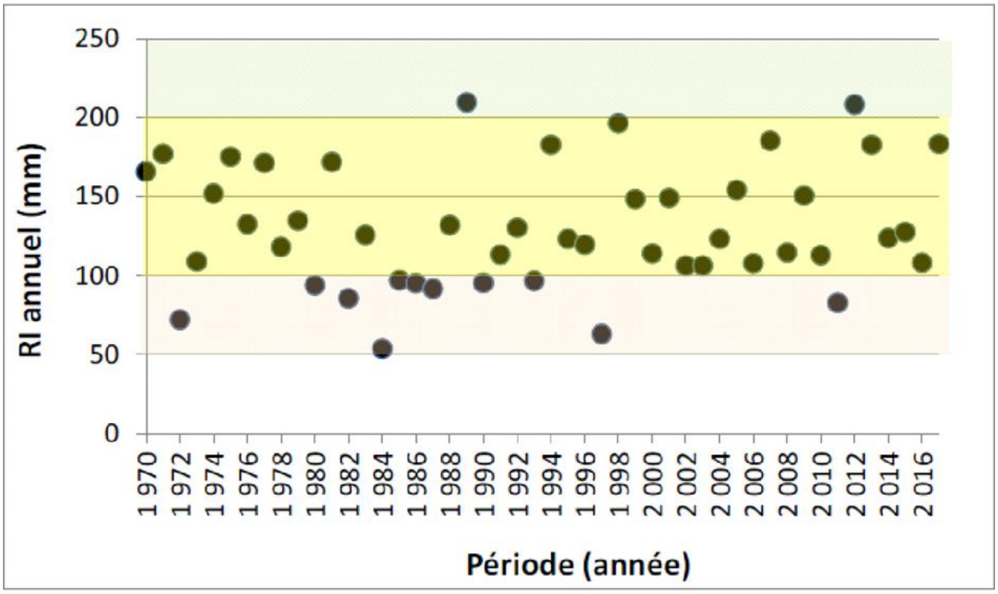

Figure 5: Evolution de l'indice d'érosivité des pluies selon les hauteurs pluviométriques interannuelles de la station Niamey Aéroport

Dynamique du ravinement sur le bassin du kori Ganguel

Le ravinement a été d'abord appréhendé sur l'ensemble du bassin versant avec des images MNT de 1989 et 2015 (**figure** 6). Le traitement des images MNT a mis en évidence une augmentation du ravinement à Ganguel. En effet, en 1989 le nombre de nœuds entre les drains a été de 71 avant de passer à 110 en 2015 soit une évolution moyenne de 1,5 nœuds/an. Sur la même période le nombre de ravins est passé de 242 à 418 soit une augmentation moyenne de 7 ravins/an. La longueur totale de l'ensemble des ravins est passée de 13,30 km en 1989 à 26,09 km en 2015 soit un accroissement de 500m/an. L'analyse de l'ensemble de paramètres (longueur totale, nœuds, et ravins) met en évidence une augmentation de l'érosion hydrique par ravinement dans le terroir de Ganguel.

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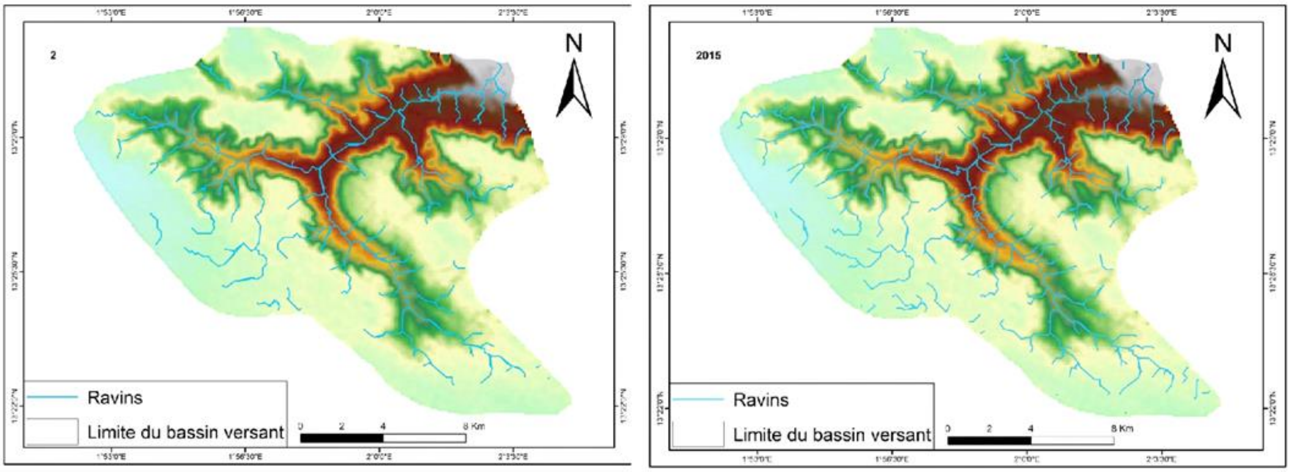

Figure 6: Carte du ravinement du bassin versant Ganguel avec des images MNT de 1989 et 2015

Le ravinement a été aussi caractérisé par des images Google Earth de 2002, 2008, et 2017 (Figure 7). Cette caractérisation a été faite dans la partie médiane du bassin versant de Ganguel où la longueur totale des ravins a été respectivement de 6,8 km, 13,7 km, et 14,6 km en 2002, 2008, et 2017 soit une érosion linéaire de près de 1m/an entre 2002 et 2008, 0,1m/an entre 2008 et 2017. Il ressort donc que la période 2002-2008 a connu une érosion 10 fois plus forte que 2008-2017 malgré une agressivité climatique moyenne du même ordre de grandeur entre les deux périodes (RI = 128,15±30,33 entre 2002 et 2008 ; RI = 139,40±40,23 entre 2008 et 2017). La forte érosion durant 2002-2008 pourrait, très probablement, être liée à une fragilisation et une sensibilité à l'érosion plus fortes des sols. La dynamique du ravinement à Ganguel est malgré tout en phase avec celle observée sur le bassin versant de Kongou au Nord-est de Niamey où un ravinement plus important a été enregistré entre 2004-2008 relativement à la période 2008-2014 (Abdourhamane Touré et al., 2017). Les analyses des nœuds et ravins ont montré la même tendance que les longueurs de ravines sur les périodes 2002-2008 et 2008- 2017. En effet, le nombre de nœuds a connu une augmentation moyenne de 6 nœuds/an en passant de 106 en 2002 à 145 en 2008. Cette dynamique est moindre sur la période 2008-2017 où la moyenne a été de 1 nœud/an entre 2008 et 2017 (Figure 7). Ainsi, l'ordre de Shreve du chenal dans la partie médiane du bassin de Ganguel a été de 94, 138 et 148 en 2002, 2008 et 2017 respectivement. L'augmentation de l'érosion sur le bassin versant de Ganguel a été aussi mise en évidence par la densité du ravinement qui est passée de 1,4 à 1,6 puis à 1,8 km/km² en 2002, 2008, et 2017 respectivement. L'augmentation du ruissellement, au cours des dernières

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décennies, est cependant généralisée sur l'ensemble du Sahel (Mahe,G et al, 2010 ; AbdourhamaneTouré,2017).

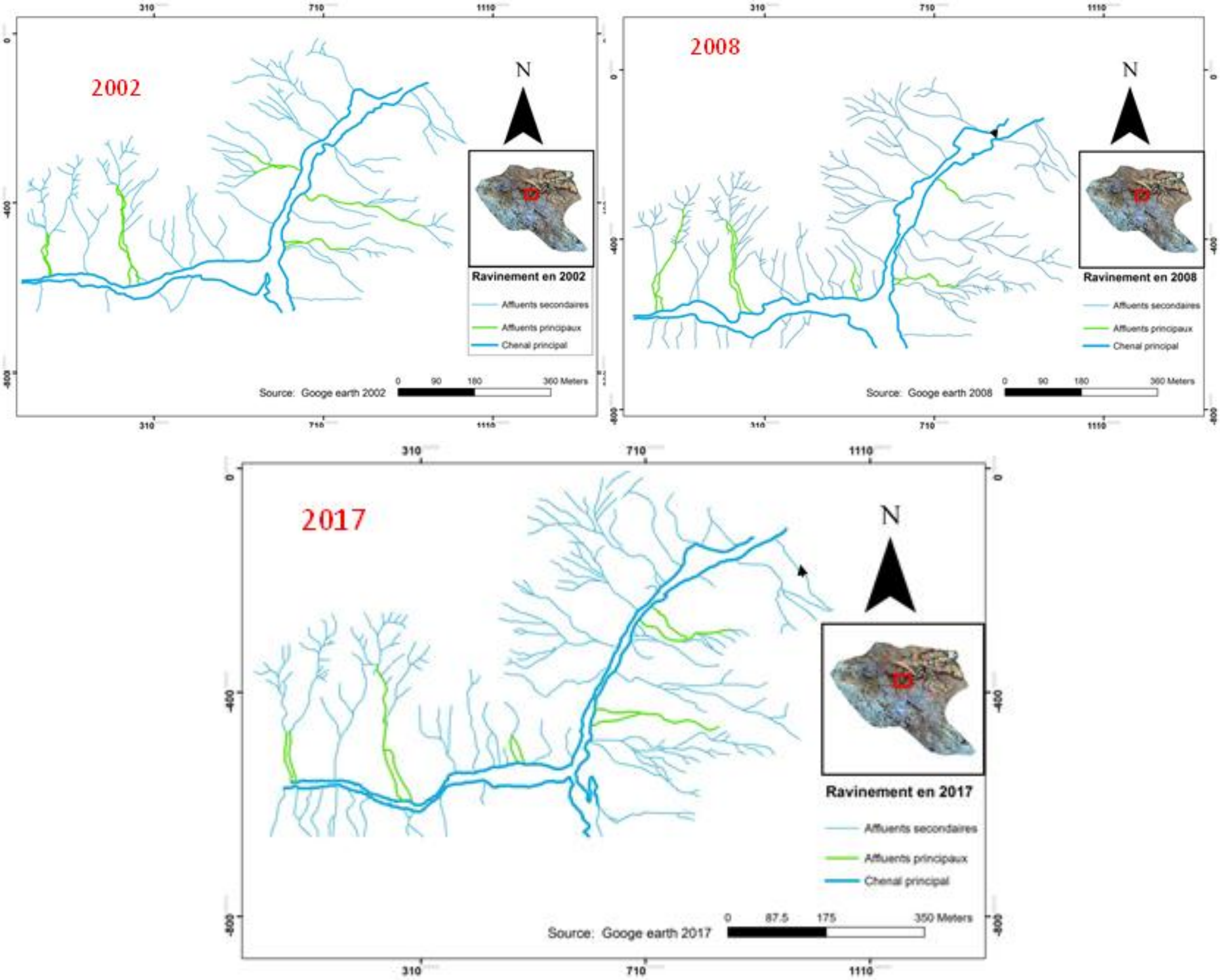

Figure 7: Carte du ravinement du bassin versant Ganguel avec des images Google earth des périodes 2002, 2008 et2017

La dynamique ravinaire a été suivie aussi à travers la largeur du chenal principal du kori Ganguel. La section du chenal a connu une érosion par recul des berges très marquée. Ce recul a atteint 40,59 m entre 2002-2008 où la largeur du chenal est passée de 292,40 en 2002 à 332,99 en 2008 soit une érosion par recul de 5,71 m/an en moyenne. Entre 2008 et 2017, le recul moyen a été de 7,20m/an. Le recul important entre 2008-2017 est principalement lié à des flux hydriques plus important dans le chenal suite à l'augmentation des ravines et de leur connectivité (figure 7). Des reculs de berges similaires ont été mesurés à Kongou où le recul a atteint 4,5m pour la période 2004-2015

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(Abdourhamane Touré et al., 2017). Cette même tendance a été observée sur le kori Boubon où des reculs moyens de berges ont varié entre 3 et 14 m/an entre 2008 et 2009 le long de six profils en travers dans le bassin versant (Mamadou, 2012).

Conclusion

L'objectif de ce travail est de caractériser la dynamique environnementale sur le bassin de Ganguel. Il s'agit spécifiquement de déterminer les dynamiques de l'érosion hydrique, de l'occupation des sols et de recueillir les appréhensions des populations sur l'évolution de leur milieu. Cette dégradation dépend du climat, des sécheresses, de la mise en culture et au déboisement en particulier. La dégradation du bassin versant Ganguel est manifestée par : i) le ravinement qui a été de 7 ravins/an entre 1989et 2015,ii) un recul des berges de 7,71m /an entre 2002 et 20017, iii) une augmentation moyenne de 4 noeuds/an entre 2002 et 2017,iv) une diminution de la végétation de 29% pour la période 1989-2015, v) une augmentation des surfaces nues et ou encroûtées de 2844 ha entre 1989 et 2015, vi) l'érosivité des pluies à Ganguel entre 1970 et 2017 n'a pas montré une tendance claire et a été régulièrement modérée (100<RI<200) L'accroissement du ravinement a permis le développement de culture de type verger le long des chenaux. Cette étude nous a permis d'observer l'ampleur et la rapidité de la dynamique d'occupation du sol et de l'érosion hydrique à l'échelle du bassin versant. Elle devrait permettre d'avoir une meilleure compréhension de la dégradation environnementale dans la zone, mais aussi servir une base de données pour les études à venir.

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