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"Read! In the name of your Lord Who has created (all that exists)"

Surah Al-Alaq (Verse 96)

NDC JOURNAL
Security Through Knowledge

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Bangladesh

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MESSAGE FROM THE CHIEF PATRON

National Defence College has been striving since 1999 with a vision to be the premier national centre of excellence on leadership, defence, security, strategy and development studies - meeting the challenges of the 21st century. Since its inception, the college has been relentlessly presenting time-befitting academic curricula to the potential policy planners, senior leaders, and strategic thinkers of the future. The college aims to create a balanced outlook and bring visualization amongst the Course Members with a strategic and operational level understanding. The chronicles of the past 27 years testify to the viability of the academic system that has contributed to this leading institution in gaining a reputation of excellence at home and abroad.

National Defence College being the highest level national institution in Bangladesh has always been emphasizing on researching contemporary issues of national importance. The common aim of research work is to enable Course Members to make original contributions to a subject of national or international interest, which influences national security and development. NDC journal reflects the notable research works carried out by Course Members and Faculty of the college. I am confident that the Research Papers included in this journal, encompassing varied subjects, would be considerably useful for the readers.

I congratulate all authors who contributed to this journal. I appreciate the sincere efforts of the Research and Academic Wing and acknowledge the hard work of the editorial board to publish this journal in due time.



Lieutenant General Md Faizur Rahman, BSP, SGP, ndc, afwc, psc
Chief Patron

EDITORIAL

National Defence College, Bangladesh is the premier national center of excellence on Leadership, Security, Strategy and Development Studies. The institution believes that a senior officer from the military and civil services should have a good understanding of the major economic, political, and social issues of the nation and be able to recommend measures to face the challenges. Hence, NDC regularly conducts various research works on contemporary issues of national as well as international importance.

NDC Journal is a bi-annual publication of National Defence College publishing selected research papers prepared by the course members. The articles for the journal (Volume 25, Number 1, June 2026) are mostly selected from individual research papers that the Course Members had submitted as part of the course curriculum. National Defence College has been very regular in bringing out 'NDC Journal' every year on time. This speaks of the laborious effort and genuine commitment on the part of both the editorial staff and the writers.

A total of 12 (Twelve) Research Papers have been adjudged for publication in the current issue in abridged form. The articles reflect complex and intricate multidimensional issues emanating from the long diversified experience of the course members and the curriculum-based deliberations and discourse on various topics concerning comprehensive national security during the training. This volume includes papers of different categories that will be able to draw the attention of varied groups of readers.

We want to express our sincere gratitude to the Chief Patron Lieutenant General Md Faizur Rahman, BSP, SGP, ndc, afwc, psc-the Commandant of NDC-for his valuable guidance. Research is a highly committed undertaking. Despite all efforts, unintentional errors in various forms may appear in the journal. We ardently request our valued readers to pardon us for such unnoticed slights and shall consider ourselves rewarded to receive any evocative criticism. We hope that all papers included in this volume will satisfy our readers.



Major General Md Masudur Rahman, ndc, psc
Editor-in-Chief

ABSTRACTS

BANGLADESH'S DEFENSE OUTLOOK FOR THE INDO-PACIFIC REGION TO MAINTAIN BALANCE AMONG MAJOR POWERS

Major General Mohammad Kaiser Rashid Chowdhury, ndc, psc, G

This article analyses Bangladesh's changing security outlook amid the evolving security environment in the Indo-Pacific. With the US-China rivalry heating up, smaller countries like Bangladesh are feeling the pressure to reconsider their security priorities and international alignments. The paper examines Bangladesh's modernisation initiatives under the Forces Goal 2030 and the institutional challenges stemming from the absence of a unified command structure and a formal national security policy.

This is qualitative research that examines cases from Vietnam, the Philippines, and Indonesia and how regional states react to countervailing forces. The data suggest a policy of calibrated neutrality by Bangladesh, which courts China, Turkey, the United States (US), Russia, and the European Union (EU) without formal alliances. However, this model often constrains procurement and operational efficiency.

The report argues that institutional reforms such as the creation of a Chief of Defence Staff (CDS), a National Security Council (NSC) and limited issue-based cooperation will enhance Bangladesh's defence capabilities, strategic autonomy and resilience in the Indo-Pacific region.

Keywords: Bangladesh's Defense Outlook, Indo-Pacific Strategy, Strategic Balancing, Forces Goal 2030, National Security Strategy, Geopolitical Competition.

CAUSES AND MITIGATION STRATEGIES FOR RIVER POLLUTION IN PERI-URBAN BANGLADESH: A CASE STUDY OF BALU RIVER, RUPGANJ, NARAYANGANJ

Brigadier General Abul Hasnat Mohammad Sayem, BGBMS, ndc, afwc, psc, MPhil

The Balu River, which flows through the rapidly urbanizing peri-urban region of Rupganj, Narayanganj, has become a critical environmental issue due to severe pollution from uncontrolled sources. The findings show that various

pollutants affect the river, including industrial effluents, untreated domestic sewage, agricultural runoff, and improper solid waste disposal. Organic pollutants, primarily originating from household waste and sewage, reduce Dissolved Oxygen (DO) levels, threatening aquatic life. Inorganic pollutants, such as heavy metals like lead (Pb), copper (Cu), arsenic (As), and chromium (Cr), from industrial discharges have been detected in water and sediments at levels exceeding safe limits in a few cases. This research makes a substantial contribution to understanding the dynamics of river pollution in peri-urban Bangladesh, laying the foundation for policy actions and implementation mechanisms to reverse environmental decline and protect the socio-ecological future of the Balu River and its dependent communities.

Keywords: Peri-urban Bangladesh, Sources of Pollution, Mitigation Strategies.

ADDRESSING SECURITY CHALLENGES OF THE DISTRESSED FORCIBLY DISPLACED MYANMAR NATIONALS IN BANGLADESH AND PREVENTION OF TRANSNATIONAL CRIMES: A QUEST TO GLOBAL PEACE EFFORTS

Brigadier General Mohammad Raisul Islam, ndc, afwc, psc

The Forcibly Displaced Myanmar Nationals (FDMN) crisis represents a long-standing humanitarian and security problem entrenched in Myanmar's systematic denial of citizenship and persecution of the FDMN minority, leading to their mass displacement into Bangladesh. This research adopts a mixed-method approach to examine how the prolonged presence of over a million FDMN in Bangladesh has transformed from a humanitarian onus into a complex security challenge that affects multiple countries. It proposes a multi-layered policy strategy that includes economic empowerment, legal reforms, information-sharing between countries, and practical plans for FDMN to return home safely. The study concludes that without a comprehensive governance approach bringing together security measures, humanitarian support, and regional partnerships, this crisis could create a "lost generation" susceptible to exploitation and radicalization.

Keywords: FDMN, Security Challenge, Humanitarian Support, Regional Partnerships.

WASTE TO ENERGY AS AN INNOVATIVE WASTE MANAGEMENT SOLUTION: CHALLENGES AND OPPORTUNITIES FOR DHAKA NORTH CITY CORPORATION

Commodore S M Sharif Ul Islam, (N), NPP, PCGM, PCGMS, ndc, psc, BN

Dhaka North City Corporation (DNCC) has been troubled by waste management issues, compounded by an overloaded landfill and related environmental problems. This paper evaluates the proposed (and partly implemented) Waste-to-Energy plant at Aminbazar using interviews with 408 respondents, comprising residents, scavengers, landfill squatters, and DNCC officials. Findings show that 85% of residents regarded landfills as dangerous, and 80% considered that Waste-to-Energy would benefit the community; however, 65% cited a lack of proper waste segregation as a major obstacle. Other obstacles range from low-calorific feedstock and emissions to scattered governance to a lack of revenue-generation options. The plant can help save up to 90% of the waste that ends up in landfills and advance circular economy goals. Its success critically depends on strong technology, inclusive governance, community confidence, regulatory enforcement, and measures like integrating waste pickers in the circularity chain model of producing electricity, source segregation promotion, indexed Feed-in Tariff (FIT) setup, emission transparency, and implementing Extended Producer Responsibility (EPR); backing up Sustainable Development Goal (SDGs) 7,11,12 and 13.

Keywords: Waste-to-Energy, Urban Waste Management, Dhaka North City Corporation, Municipal Solid Waste.

MANAGEMENT OF HAZARDOUS MATERIAL FOR GREEN SHIP RECYCLING AS PER HONGKONG CONVENTION 2009: A STUDY OF SHIP RECYCLING YARDS IN BANGLADESH

Commodore A H M Rafiqul Islam, (E), NUP, ndc, psc, BN

The study explores the current practices of Hazardous Material (HAZMAT) management in Bangladesh and reviews selected international best practices with a view to suggesting management methods of HAZMATs for green ship recycling in light of the Hong Kong Convention (HKC). The study emphasizes the pressing need for developing indigenous technologies and methods that

leverage local resources and skills rather than relying solely on foreign practice. This paper advocates for 'Capacity Building', 'One-Stop Solution', establishment of a Treatment Storage and Disposal Facility (TSDF), and development of a Research and Innovation Center that are likely to bring a positive impact on current ship recycling practices of Bangladesh.

Keywords: Ship Recycling, Shipbreaking Industry, Hazardous Material, One-Stop Service.

INCLUSIVE EDUCATION FOR CHILDREN WITH DISABILITIES: THE CASE OF PRIMARY EDUCATION DEVELOPMENT PROGRAM IN BANGLADESH

Joint Secretary Rokeya Khaton, ndc

The purpose of the study is to evaluate the contribution of the Primary Education Development Program (PEDP), as an approach to mainstreaming children with disabilities (CWDs) into the primary education sub-sector in Bangladesh. The study was conducted using both qualitative and quantitative research methods through an equity lens. Both primary and secondary data were used to conduct the study. The findings of the study, based on both primary and secondary data, indicate that PEDP has made a substantial contribution to increasing enrollment rate and gender balance in primary education in Bangladesh. Nevertheless, PEDP ignores equity and social inclusion for CWDs. The study identified contradictory and inconsistent policies, coordination gaps among Ministries, lack of awareness of the social context, a traditional teaching-learning process, and a scarcity of reliable and adequate data as the main barriers to Inclusive Education (IE) implementation. Providing both policy- and operations-level recommendations to guide PEDP5, the study emphasized the need for further studies to examine the performance of PEDP4.

Keywords: Children with Disabilities, Disability, Equity, Inclusive Education, Social Model of Disability.

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LEADERSHIP CHALLENGES IN A MULTI-GENERATIONAL MILITARY ENVIRONMENT AND A PROBABLE WAY FORWARD

Brigadier Jitesh Ralli, ndc

The Armed Forces today comprise multiple generations serving simultaneously, from senior leaders shaped by traditional military culture to younger officers immersed in digital environments. This coexistence of Generations X, Y, and Z presents both opportunities and challenges for leadership. While younger cohorts bring adaptability, technological fluency, and innovative thinking, senior officers contribute institutional knowledge, discipline, and experience. The effectiveness of military organizations, therefore, depends on leadership processes that integrate these diverse strengths while addressing differences in values, cognitive styles, and expectations.

This study explores the dynamics of a multi-generational military environment, with particular focus on the Indian subcontinent. It examines the applicability of generational theories, the role of technology in shaping identity, and the relevance of leadership models such as transformational and life cycle theories. A mixed-method approach was employed, combining literature review, surveys, and case-based analysis to assess how leadership styles align-or fail to align-with generational differences in the Armed Forces.

Findings indicate that traditional leadership processes alone are insufficient in managing generational diversity. Leaders must adopt more adaptive, inclusive, and transformational approaches to maintain cohesion and operational effectiveness. The study contributes to existing scholarship by bridging a critical gap in research on military leadership and generational diversity in South Asia, and it offers practical recommendations for strengthening leadership practices in a rapidly evolving security environment.

Keywords: Military Leadership, Leadership Challenges, Military Environment, Armed Forces.

THE ROLE OF VOLUNTEER FORCES IN SUSTAINABLE PEACE AND COMMUNITY DEVELOPMENT IN NORTH EAST NIGERIA: CHALLENGES AND OPPORTUNITIES

Colonel Tajudeen Ajibola Lamidi, ndc, fwc, psc (+)

This study examines the roles, issues, and prospects associated with the engagement of Volunteer Forces in Nigeria, particularly in North East Nigeria. Structural, institutional, and operational challenges seem to inhibit the efforts of the Volunteer Forces, despite their remarkable contributions to security and community development. The study employed a mixed-methods design consisting of qualitative and quantitative approaches. The study's findings reveal significant support for local security, intelligence gathering, and peacebuilding, but highlight gaps in legal recognition, funding, training, and coordination. The study concludes that structured policy frameworks, capacity building, and institutional integration are critical to enhance Volunteer Forces' effectiveness and sustainability.

Keywords: Volunteer Forces, Community Development, Sustainable Peace, National Security, Security Collaboration.

ENHANCING CROSS DOMAIN SYNERGY THROUGH DIGITAL INTEGRATION OF OPERATIONAL FIRE IN THE CONTEXT OF NETWORK CENTRIC WARFARE: A BANGLADESH ARMED FORCES PERSPECTIVE

Lieutenant Colonel Tanvir Ahmed, afwc, psc, G, Artillery

The character of warfare has experienced a significant metamorphosis over the past two decades. Military operations that were once principally platform-centric are now gradually influenced by digitally networked, data-driven campaigns. Analyses of contemporary conflicts reveal that the speed of information processing, real-time decision-making, and effective synchronization across multiple domains have decisively altered the fate of wars. The seamless ability to integrate, visualize, and coordinate effects across land, maritime, air, and emerging domains is sine qua non in ascertaining victory or defeat alongside firepower or numerical supremacy. This paper, at its core, examines how best Bangladesh Armed Forces (BDAF) may enhance cross-domain synergy by

digitally integrating operational fire within the context of Network Centric Warfare (NCW). To achieve the research objectives, apart from consulting numerous research works, publications, and online resources, a mixed-method approach has been adopted, drawing on survey responses from 261 respondents and qualitative inputs through Key Informant Interviews (KIIs) and Focused Group Discussions (FGDs). While statistical inputs from Statistical Package for Social Sciences (SPSS) have established significant correlations between digital integration and cross-domain synergy, qualitative understandings from NVivo have illuminated organizational, technological, and doctrinal grey areas. Both quantitative and qualitative analyses reveal that existing constraints of BDAF are highlighted by limited interoperability, delays within the sensor-to-shooter loop, and the absence of a unified digital command framework. Knowledge gleaned through the study of global models like the U.S Joint All-Domain Command and Control (JADC2), India's C4I systems, and China's Integrated Joint Operations Command System (IJOCS), this research recommends a hybrid, AI-enabled model customized for BDAF, which can be implemented through a well-planned and time-phased roadmap.

Keywords: Operational Fire, Lethal Fire, Non-lethal Fire, Integration of Operational Fire, Doctrine, Joint Fires Coordination Cell, Interoperability.

INSTITUTIONALISING JOINT WARFARE STUDIES IN THE BANGLADESH ARMED FORCES: NEEDS ASSESSMENT AND FRAMEWORK DEVELOPMENT

Lieutenant Colonel Md Wadud Ullah Chowdhury, afwc, psc, Infantry

The necessity and feasibility of institutionalising Joint Warfare Studies in the Bangladesh Armed Forces form the central theme of this research. Despite praiseworthy advancements in service-specific modernisation, the Armed Forces of Bangladesh continue to face limitations due to the absence of a combined platform for joint doctrinal development, policy analysis, strategic research, and unified operational planning. The objective is to assess how a Joint Warfare Study Centre (JWSC) could fill these gaps, foster cross-service synergy and enhance defence preparedness. A mixed-method approach was employed, combining surveys, focus group discussions, and key informant interviews with serving and retired senior military officers and academics.

Comparative analysis of global models offered a valuable insight into best practices and institutional yardsticks. The study also developed a proposed framework for the JWSC, including its structure, functions and areas for collaboration in policy analysis and strategic research. The findings imply broad support for establishing such an institution to boost doctrinal coherence, tri-service jointness and strategic foresight. Challenges including resource limitations, organisational resistance and the need for civil-military academic integration were identified. The research concludes that establishing the JWSC is necessary and feasible through a phased and well-planned approach. Its establishment would serve as a keystone for advancing the capability of Bangladesh Armed Forces for joint warfare planning, enhancing strategic preparedness and ensuring long-term defence resilience.

Keywords: Bangladesh Armed Forces, Joint Warfare Studies, Inter-Service Synergy, Doctrinal Development, Policy Analysis.

THE ROLE OF TECHNOLOGY TRANSFER AND JOINT VENTURES IN UNMANNED AERIAL VEHICLE PRODUCTION FOR THE BANGLADESH AIR FORCE: A DRIVE TOWARDS SELF-RELIANCE

Group Captain Azim Ahmed, afwc, psc, GD(P)

The study is entitled "The Role of Technology Transfer (ToT) and Joint Ventures (JV) in Unmanned Aerial Vehicle (UAV) Production for the Bangladesh Air Force (BAF): A Drive Towards Self-Reliance." The overall objective of the study has been to suggest the role of ToT and JVs in manufacturing UAVs for BAF to support future self-reliance. This research paper examines the role of ToT and JVs in helping BAF to develop its own UAVs. The goal is to reduce dependence on foreign suppliers and move toward self-reliance in defence technology. The study highlights BAF's current efforts, including Aerospace Research and Development Complex (ARDC's) work, and reviews progress in developing indigenous UAV prototypes. However, it finds that many challenges still exist. These include a lack of long-term funding, insufficient skilled manpower, and problems with procurement policies. The paper uses both primary data from interviews with senior BAF officials and survey responses from technical personnel to understand the real situation. It also examines successful UAV programs in countries such as Türkiye, India, and Pakistan to draw lessons for Bangladesh. The study finds that, although Bangladesh has technical potential,

progress is slowed by the absence of a long-term strategic plan. The paper recommends key reforms to overcome existing barriers by establishing a dedicated UAV development authority and providing legal protection for intellectual property. It also recommends institutional restructuring and capacity building. The study finds that Government to Government (G2G) contracts, particularly those involving embedded ToT and JV mechanisms, offer more strategic and secure pathways for BAF than Public Private Partnership (PPPs), which remain constrained by institutional limitations and capacity shortfalls. The findings are intended to support policymakers and defence planners in forming effective roadmap for achieving sustainable UAV production though ToT and JV.

Keywords: Technology Transfer, UAV, ToT, Joint Venture.

QUEST FOR CREDIBLE DETERRENCE: OPTIONS FOR BANGLADESH ARMY

Colonel G M Shamsuzzaman, afwc, psc

Bangladesh (BD) promotes 'security through development' and aspires to be recognized as a developed nation. Thus, BD respects peaceful coexistence with its potential adversaries. The Army is always ready to make the supreme sacrifice to safeguard the country's sovereignty and territorial integrity. Having a very strong military power is an option for us to deter any invader. However, a huge investment in military modernization might not help BD achieve growth in other development sectors. Instead of focusing solely on a military response, it is possible to maintain peaceful coexistence, a progressive economy, and stable security through a combination of diplomacy, power projection, and military means. Therefore, BD's Defence Policy is fundamentally based on three pillars; Defence Diplomacy, Deterrence and Defeating a Hostile Design. To maintain peace and stability, the BD Army needs to develop into a credible deterrent force to secure its territorial integrity and economic progress. The Bangladesh Army has existed for more than 54 years since independence, yet it still lacks a coherent deterrent policy. Now the question is: how can the BD Army serve as a genuine deterrent to the potential threat? To answer that, this paper seeks to develop viable deterrence options for the BD Army.

Keywords: Deterrence, Doctrine, Defensive Strategy, Offensive Posture, Aggressive Action.

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BANGLADESH'S DEFENSE OUTLOOK FOR THE INDO-PACIFIC REGION TO MAINTAIN BALANCE AMONG MAJOR POWERS

Major General Mohammad Kaiser Rashid Chowdhury, ndc, psc, G

Introduction

Bangladesh, a littoral state of the Bay of Bengal, is strategically located in the Indo-Pacific, which is becoming a region of increasing geopolitical competition among the major powers, including the United States (US), China, India, and Japan. Bangladesh followed a policy of non-alignment in foreign relations after independence, balancing its relations with global powers and gradually diversifying its economy. The US remains its largest export market, China its largest source of imports, India its major trading partner, and Japan a long-time development partner. However, the security landscape in the Indo-Pacific is changing fast. China's Belt and Road Initiative (BRI) continues to expand. The US is seeking to counter China's rise, and initiatives such as the Quadrilateral Security Dialogue (QUAD) and Australia, UK, United States (AUKUS) are shifting the regional balance of power. Immediate security implications include India's regional dominance and internal instability in Myanmar. The continued presence of 1.5 million Rohingya refugees is degrading Bangladesh's national security environment. The country's traditional neutrality has served it well but these shifting dynamics require an adaptive defence outlook that can defend national interests without embroiling itself in great-power competition.

Given this backdrop, a reassessment of Bangladesh's defence posture is warranted. Thus, the study seeks to determine whether the country's current orientation remains an appropriate response to the changing security environment in the Indo-Pacific (Waltz, 2002; Ghosh, 2017).

Intensifying rivalries between global and regional powers are structurally transforming it, and Bangladesh is becoming increasingly vulnerable to the fallout. Recent internal political developments, such as the 2024 Monsoon Revolution and the formation of an interim government, have raised questions about the direction of foreign policy. The relationship continues to be affected by India's concerns about political change and outstanding bilateral issues, including border killings, water sharing, and a trade imbalance (Chaudhury, 2019; Riaz, 2023). There has also been a growing diplomatic outreach to China and Pakistan, which is being viewed as a possible geopolitical shift. Strategic ambiguity is heightened by China's expanding footprint in South Asia through the Belt and Road Initiative (BRI) and defence cooperation (Zhao, 2020; Haque, 2021) and the larger maritime footprints of the major powers in the Bay of Bengal (Singh, 2020; Hossain, 2018).

Myanmar remains under threat from internal conflict, the unresolved process of repatriation of Rohingya, and the deepening military ties with China, India, and Russia (Kaur, 2021; Kozhin, 2020). There is little international help to deal with the Rohingya crisis, and Bangladesh is under increasing pressure on its southeast frontier. These developments pose a critical strategic question: Should Bangladesh pursue its traditional policy of neutrality or adopt a more flexible defence posture by selectively aligning with a few major powers?

The research examines the sustainability of Bangladesh's current defence orientation and strategic options for balancing relations among competing powers in the Indo-Pacific. It tries to assess Bangladesh's defence perspective, the implications of neutrality or selective alignment and policy options to protect national interests. The study is of academic and strategic significance as it addresses the gaps in the literature on small-state defence behaviour in a contested Indo-Pacific (Ghosh, 2017; Walt, 2017). It also has practical utility for policymakers in revising force development plans and defence partnerships (Rahman, 2016; Jahan, 2021).

Research employs qualitative methods such as document analysis, expert interviews, case studies, and specialized group discussions. It relies on theories of the security dilemma, the balance of power, and strategic autonomy. Overall, the study hypothesises that Bangladesh may have to accept greater flexibility, possibly tilting towards certain major powers, to secure her strategic interests amid intensifying Indo-Pacific competition.

Review of Literature

Bangladesh's Indo-Pacific Outlook reinforces Dhaka's preference for non-alignment and rule-based maritime cooperation (MoFA, 2023). The Indo-Pacific strategies of major powers and their implications for Bangladesh are presented in Table 1.

Table 1: Indo-Pacific Strategies of Major Powers and Implications for Bangladesh

Actor	Strategic Focus	Key Actions	China Factor	Implications for Bangladesh
USA	FOIP, maritime security	Quad coordination, IPS	Contains China	Cooperation opportunities; risk of BD-China tension
UK	Post-Brexit Asia tilt	Naval presence, India ties	Counters China	Limited role; scope for governance/security support
France	Maritime security	Indo-Pacific partnerships	Indirect China restraint	Naval training and blue economy cooperation
China	BRI and military ties	Infrastructure, defence exports	Challenges US/India	Economic benefits; risk of dependence
India	Regional leadership	Act East, naval expansion	Countering China	Connectivity gains; unresolved disputes

Actor	Strategic Focus	Key Actions	China Factor	Implications for Bangladesh
Russia	Defence and energy role	Arms sales, nuclear cooperation	Aligns with China	Diversified arms; sanctions risks
ASEAN	Neutrality, inclusivity	AOIP	Avoids rivalry	Framework for regional integration
Japan	FOIP, BIG-B	Infrastructure, defence tech	Counters China	Industrial growth; defence cooperation
Source: Researcher's Construct				

Bangladesh's Indo-Pacific Outlook complements its balanced diplomacy. It maintains neutrality while strengthening maritime security, legal compliance, and regional connectivity (Islam, 2020; Hossain, 2018). Academic interpretations highlight Bangladesh's preference for economically driven engagement and strategic neutrality, rooted in its foreign policy doctrine (Mohsin, 2022; Riaz, 2023). Regional middle powers such as Vietnam, the Philippines, and Indonesia provide comparative insights for Bangladesh (Table 2). These states use tailored strategies balancing alliances and flexible non-alignment to avoid entanglement while addressing China's assertiveness. For Bangladesh, similar vulnerabilities suggest the utility of diversified partnerships, maritime capacity-building, and soft balancing.

Table 2: Indo-Pacific Strategies of Major Powers and Implications for Bangladesh

Country	Strategy	Main Concerns	Key Partners	Alliance Status
Vietnam	Balancing	South China Sea	US, Japan, India	No formal alliances
Philippines	Alliance-based	Chinese incursions	US, Japan	US treaty ally
Indonesia	Non-aligned hedging	Natuna Sea	US, China, Japan	ASEAN-centric neutrality
Bangladesh	Soft balancing	Border/maritime security	China, India, US, Japan	Non-aligned
Source: Researcher's Construct				

Bangladesh's Current Defence Policy and Strategic Challenges

Bangladesh's Defence Policy 2018 provided the country's first formal framework for preserving sovereignty, safeguarding territorial integrity, and promoting peaceful coexistence. Rooted in a tradition of non-alignment, the policy relies on diplomacy, development-led deterrence, and extensive experience in United Nations (UN) peacekeeping. However, intensifying Indo-Pacific rivalries, instability in Myanmar, and persistent capability limitations underscore gaps in the existing posture. Militarization of the Bay of Bengal, combined with recurring border tensions, requires sharper operational doctrines and stronger deterrence (Chowdhury, 2023; Khan, 2024). Notable strengths include inter-agency coordination via the National Committee on Security Affairs (NCSA), recognition of non-traditional threats, and alignment with Forces Goal 2030. However, the policy offers no specific threat matrix, red lines, or minimum deterrence thresholds. These gaps became visible during Myanmar's airspace violations and landmine incidents between 2022–2024.

Bangladesh's strict neutrality has slowed modernization, as seen in delays in the Multirole Combat Aircraft (MRCA) program. Limited strategic depth with major partners constrains access to advanced technology and training. China remains a dominant supplier, but its ties with Myanmar introduce uncertainty. A more flexible strategy that strengthens ties with Turkey, Japan, or South Korea would enhance Intelligence, Surveillance and Reconnaissance (ISR), air defence, and radar capabilities (Islam, 2022). Following maritime settlements with Myanmar and India, Bangladesh gained a large Exclusive Economic Zone (EEZ) but lacks deep-sea patrol capacity and integrated maritime domain awareness. Despite naval progress, persistent gaps in radar coverage, underwater surveillance, and maritime deterrence remain (Bay of Bengal Institute, 2024). Engagement with ASEAN, EU, and Quad-plus partners can support capability development.

Bangladesh's strategic culture has traditionally prioritized internal stability and disaster response. The absence of a National Security Council or defence think tank limits long-term scenario planning, unlike in countries such as Singapore, where institutionalized foresight drives defence innovation. Heavy dependence on foreign suppliers persists due to limited domestic capacity. Local industries remain focused on low-tech production. Investment in dual-use Research and Development (R&D), defence startups, and university industry partnerships similar to the models of Turkey or South Korea, would improve long-term self-reliance (Khan, 2024). The Armed Forces Division's Joint Training Doctrine (2023) reflects a shift toward integrated, multi-domain operations to address evolving hybrid threats (IISS, 2023). A comparative snapshot of joint doctrine and force integration in South and Southeast Asia is shown in Table 3.

Table 3: Joint Doctrine in South and Southeast Asia

Country	Joint Doctrine	CDS	JFHQ	Tri-Service Exercises	Cyber/Space Integration
Bangladesh	Yes (2023, conceptual)	No	No	Limited	Emerging
India	Yes	Yes	Yes	Regular	Integrated
Vietnam	Yes	No	General Staff	Periodic	Growing
Indonesia	Yes	Yes	Yes	Frequent	Modernization focus
Philippines	Evolving	No	Yes	Regular	Developing

Source: Researcher's Construct

Bangladesh remains behind peers without a Chief of Defence Staff (CDS) or Joint Forces Headquarters (JFHQ). Implementation requires establishing a CDS, forming a JFHQ, and conducting regular joint exercises. Table 4 shows procurement trends of the Bangladesh Armed Forces and strategic shifts over the last 15 years.

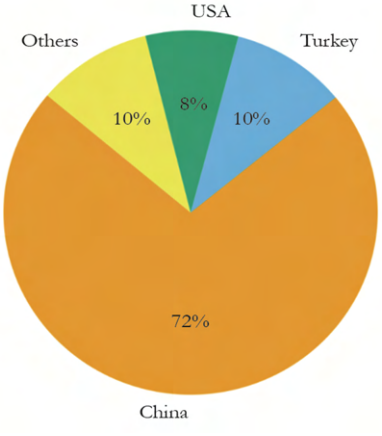
Table 4: Procurement Trends of Bangladesh Armed Forces

Period	Drivers	Main Suppliers	Focus	Key Issues
2010–15	Immediate needs	China, Russia	Army	Logistics
2015–20	Capability expansion	China, UK, Turkey	Navy/Air	Interoperability
2020–25	Joint readiness	Turkey, China, West	Tri-service	Financing, delays

Source: Researcher's Construct

Bangladesh's Defense Sourcing Study. The Bangladesh Army relies primarily on China for its core platforms, including tanks, artillery, and armored vehicles. Turkey is emerging as a partner in recent years. The Army's moderate engagement with the United States provides limited equipment and training support.

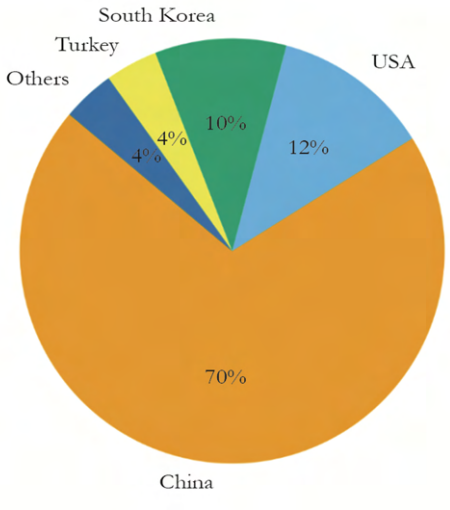
Figure 1: Bangladesh Army's Sourcing Matrix



Source: Researcher's Construct

China remains the principal source of major naval platforms. The Navy's collaboration with South Korea shows growing industrial and shipbuilding cooperation. Partnerships with the US and Turkey add diversity and strengthen maritime domain awareness.

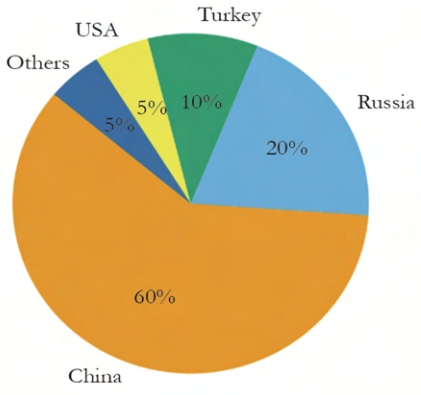
Figure 2: Bangladesh Navy's Sourcing Matrix



Source: Researcher's Construct

The Air Force has a mixed sourcing pattern. China provides most of the aircraft fleet, while Russia supplies combat jets and engines. Turkey's growing defense links are seen in Unmanned Aerial Vehicle (UAV) and avionics cooperation. Engagement with the US and others supports training, surveillance, and maintenance capabilities.

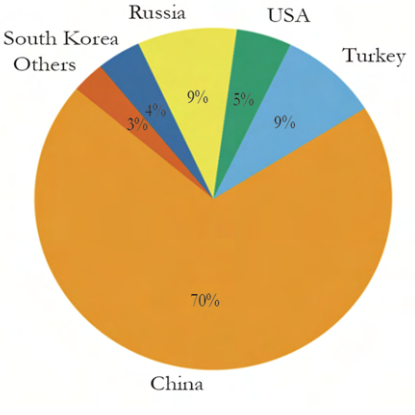
Figure 3: Bangladesh Air Force Sourcing Matrix



Source: Researcher's Construct

The combined sourcing pattern of the Bangladesh Armed Forces shows Bangladesh's overreliance on China (more than two-thirds of its total defense equipment). Turkey's share is growing steadily. Russia, the United States, and South Korea each maintain a modest but important role. They contribute aircraft, maritime assets, and maintenance support. Overdependence on China may be risky in the event of a Bangladesh-Myanmar (BD-MN) conflict.

Figure 4: Bangladesh Armed Forces Sourcing Matrix

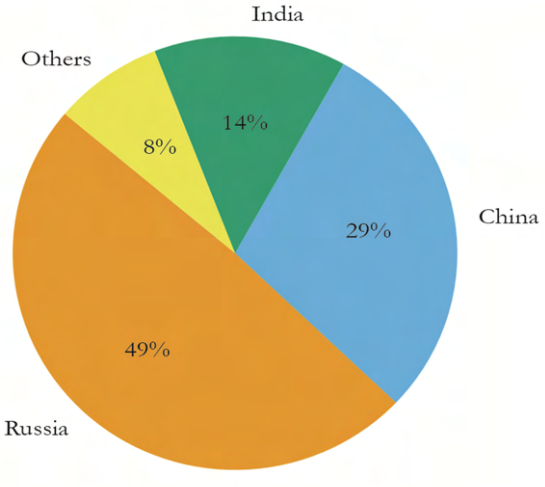


Source: Researcher's Construct

Comparative Defense Sourcing Study (Bangladesh and Regional Context). A comparative analysis of defense sourcing patterns across Bangladesh, Myanmar, and three regional peers-the Philippines, Vietnam, and Indonesia was conducted. It highlights procurement dependencies, strategic alignments, and diversification efforts in the Indo-Pacific context, drawing key lessons for Bangladesh.

Sourcing Matrix of Myanmar. Myanmar remains heavily reliant on Russia (49%). However, China (29%) and India (14%) are also dominant. It illustrates diversification and a balanced strategy.

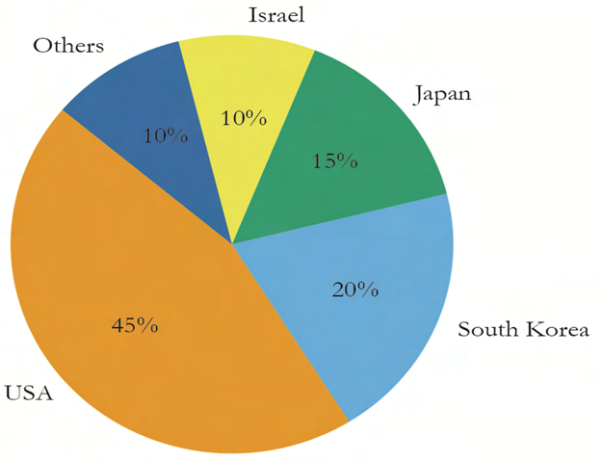
Figure 5: Sourcing Matrix- Myanmar



Source: Researcher's Construct

Sourcing Matrix of the Philippines-US: **The Major Source**. However, the share of Korea, Japan, and Israel is also substantial. It shows a diversified, balanced strategy.

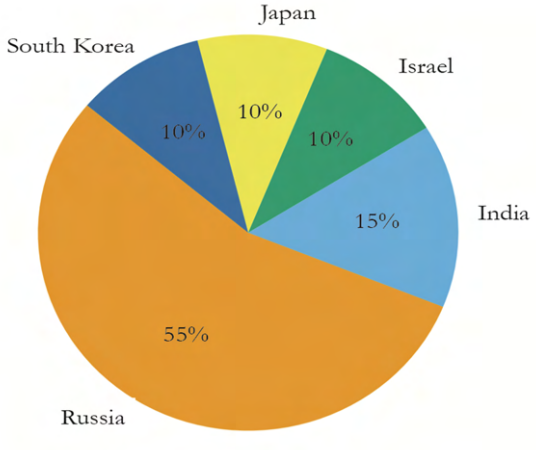
Figure 6: Sourcing Matrix of Philippines



Source: Researcher's Construct

Sourcing Matrix of Vietnam. Vietnam is heavily reliant on Russia (55%). The remaining 45% is sourced from Korea, Japan, Israel, and India-a balanced strategy.

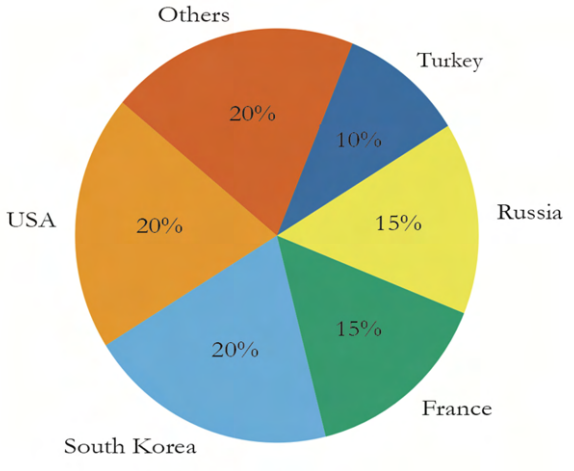
Figure 7: Sourcing Matrix of Vietnam



Source: Researcher's Construct

Sourcing Matrix of Indonesia. It maintains a diversified and balanced sourcing strategy, purchasing hardware from South Korea, France, Russia, the US, and Turkey.

Figure 8: Sourcing Matrix of Indonesia



Source: Researcher's Construct

Implications for Bangladesh. Bangladesh needs to reduce its overdependence on China gradually. Bangladesh must continue to diversify its defense acquisition, so as not to be reliant on any one partner. Selective alignment of Eastern and Western partnerships will support credible deterrence and modernisation under Forces Goal 2030. These patterns suggest that small and middle powers in the Indo-Pacific are adopting flexible strategies and diversification to safeguard their autonomy amid great-power competition. For Bangladesh, they also need supplier diversity and a slow de-emphasis on China. Strengthen strategic resilience and credible deterrence cost-effectively by deepening relations with Turkey and South Korea, utilising Japanese financing, and expanding domestic defense production. Bangladesh has made progress under Forces Goal 2030, but unevenly. Greater coordination among institutions, diversification of suppliers, and investment in local defense industries are crucial.

A national defense strategy and appointment of a CDS would help bring planning together and ensure long-term modernisation. Table 5 summarises procurement challenges for capital platforms.

Table 5: Summary of Procurement Challenges of Capital Platforms

Challenge Category	Key Issues
Budgetary Constraints	Limited defense budget relative to modernization goals; low defense-to-GDP ratio
Lack of Strategic Framework	No national security strategy or defense white paper; fragmented procurement planning
Institutional Gaps	No CDS or unified command; inter-service coordination remains weak
Dependence on External Suppliers	Heavy reliance on China, Russia, Turkey; weak indigenous industry
Geopolitical Pressures	Procurement politicized due to strategic hedging; MRCA acquisition stalled
Technical & Logistical Capacity Gaps	Shortage of trained personnel, maintenance capacity, doctrinal adaptation delays
Procurement Delays	Multi-layered approvals and bureaucracy slow down the procurement process

Source: Researcher's Construct

Need for Openness Towards Tilt in Defence Outlook: Qualitative Analysis and Hypothesis Verification

Bangladesh has historically followed an equidistance strategy, allowing it to avoid entanglement in great-power rivalries while benefiting from broad diplomatic and economic partnerships. However, intensifying polarization in the Indo-Pacific, expanding US-China rivalry, and growing expectations for clearer alignments are narrowing the space for

strict neutrality. Regional developments, including rising naval activity in the Bay of Bengal and persistent instability along the Bangladesh–Myanmar border, underscore the need to reassess non-alignment in defence strategy. Evidence from Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) shows that Bangladesh's defence posture is constrained by overdependence on Chinese military supplies, the absence of a defence white paper, and the slow acquisition of critical capabilities such as the MRCA. The changing geopolitical situation suggests that Bangladesh would be better served by a flexible interest-driven tilt, not an abandonment of neutrality but an adaptive strategy that enhances defence preparedness and retains strategic maneuverability in a multi-polar region.

The hypothesis checking is performed on the following indicators:

- Expanded joint training and dialogues with non-traditional partners (U.S., Turkey, France, Japan).
- Diversification of procurement, reducing dependence on China and Russia.
- Support for shared security principles including freedom of navigation.
- Preferential or technological treatment from major powers.
- Openness of doctrine is evident in documents such as Bangladesh's 2023 Indo-Pacific Outlook.

These indicators provide a means to gauge whether any nascent change in strategic orientation is already underway in Bangladesh.

Case Studies of Strategic Engagement

Case 1: Engagement with the United States

Bangladesh–US defence ties have expanded through frameworks such as Trade and Investment Cooperation Forum Agreement (TICFA), the

proposed General Security of Military Information Agreement (GSOMIA), and the Acquisition and Cross Servicing Agreement (ACSA). GSOMIA remains a prerequisite for the transfer of sensitive military hardware. Joint exercises such as Tiger Lightning have strengthened interoperability, particularly in maritime and special operations. Despite periodic friction over human rights concerns, Bangladesh has maintained functional cooperation on counterterrorism, peacekeeping, and humanitarian response. This demonstrates a selective tilt based on operational benefits rather than ideological preference.

Case 2: Deepening Defence Cooperation with Turkey

Turkey has become an important supplier of cost-effective platforms, including T-300 Multiple Launch Rocket System (MLRS), UAVs, and armored vehicles. Its willingness to offer technology transfers and to maintain politically neutral defence ties aligns well with Bangladesh's diversification goals. Engagement with Turkey helps reduce overdependence on China while avoiding negative reactions from the US or India. This cooperation reflects a pragmatic, capability-driven tilt.

Case 3: Development-Focused Partnership with Japan

Japan's engagement emphasizes non-military capacity-building, maritime awareness, and connectivity under Free and Open Indo-Pacific (FOIP) and Bay of Bengal Industrial Growth Belt (BIG-B). Although Japan is not a key defence supplier, its support for coast guard equipment, training, and maritime infrastructure strengthens Bangladesh's strategic depth without provoking geopolitical sensitivities. This represents a low-risk, rules-based partnership model.

Case 4: Calibrated Engagement with China

China remains Bangladesh's largest defence supplier and will remain essential for sustaining existing platforms. However, Bangladesh has carefully avoided granting China basing rights or exclusive defence

access, signaling a desire to avoid strategic entanglement. Cooperation remains transactional, leveraging Chinese hardware and BRI financing while managing exposure to US–China rivalry.

Case 5: Declining Engagement with Russia

Bangladesh historically relied on Russia for MiG aircraft, helicopters, and APCs. After the conflict in Ukraine, sanctions and supply chain disruptions made Russian platforms less viable. Bangladesh is now shifting towards Turkey, South Korea, NATO countries, and Western partners, demonstrating a cautious yet clear trend of diversification. A summary of Bangladesh's strategic engagements with major powers is shown in Table 6.

Table 6: Bangladesh's Strategic Engagements with major powers

Partner	Nature of Engagement	Strategic Logic	Key Gains	Mitigation/Risk Management
US	TICFA, GSOMIA (pending), exercises	Interoperability, maritime security	Training, peacekeeping, counterterrorism	Maintain cooperation without alignment
Turkey	UAVs, MRLs, armoured vehicles	Diversification, cost-effective tech	Access to niche capabilities	Issue-based engagement; avoid entanglement
Japan	FOIP, BIG-B, maritime support	Rules-based order, low-risk cooperation	Maritime capacity-building	Avoid military procurement to reduce tensions
China	Major defence supplier	Affordable weapons, BRI financing	Naval, air, land platforms	No basing rights; transactional approach
Russia	Legacy platforms & training	Historical ties, low-cost systems	APCs, jets, helicopters	Reduce exposure; shift to diversified suppliers

Source: Researcher's Construct

Qualitative Analysis and Hypothesis Validation

Patterns from the case studies reveal a quiet but deliberate shift. Bangladesh does not seek alliances or foreign basing arrangements but continues to diversify its defence partnerships. Further, the 2023 Indo-Pacific Outlook signals doctrinal openness to wider maritime cooperation, freedom of navigation, and inclusive regional norms, without taking sides. The hypothesis is strongly validated: Bangladesh's interest-based tilt toward major and middle powers is flexible and benefits Bangladesh by increasing its capabilities, hedging against regional volatility, and preserving its strategic autonomy. This shift is not a break from neutrality but an evolution towards a more agile, pragmatic defence posture suited to the competitive environment of the Indo-Pacific.

Why Bangladesh's Defence Outlook Needs Flexibility and Openness to Tilt

Bangladesh's traditional policy has been to pursue an equidistant, non-aligned defence policy which has helped it maintain balanced relations with major powers. The current Indo-Pacific environment is more polarised and more effective than it was during previous global rivalries. The US-China rivalry is intensifying, and India's aggressive stance in the region complicates efforts to maintain strict neutrality (Ghosh, 2017; Zhao, 2020). The strategic contestation between the QUAD partners and China's BRI network further constrains the diplomatic space. At the same time, border tensions with India and the continued instability in Myanmar continue to test the efficacy of Bangladesh's balancing strategy (Islam, 2020).

Bangladesh can close its existing capability gaps through selective strategic alignment and assistance in implementing Forces Goal 2030. This is an ambitious modernisation plan, but procurement delays and a

lack of strategic coherence have constrained it. Bangladesh has been able to tap into advanced technologies, training, and logistical support that cannot be produced internally through targeted partnerships with countries such as Turkey, Japan, and France (Jahan, 2021). Examples include the induction of Turkish MLRS systems and dual-use technology cooperation with Japan. These alignments also facilitate knowledge and research transfer, thereby reducing Bangladesh's historical overreliance on China and Russia (Rahman, 2019).

A larger network of defence partnerships also brings major economic and technological dividends. Bangladesh does not have a sophisticated defence industrial base at present; therefore, foreign collaboration is essential for maintenance, repair, and overhaul (MRO) and technological up-gradation. Partnerships with South Korea, France and Japan can help to build domestic capabilities, boost the cyber and aviation sectors, and attract foreign investment in defence adjacent industries (Kaur, 2021).

Maritime security is another strong case for strategic openness. The country's location in the Bay of Bengal makes it vulnerable to non-traditional threats and to increasing great-power naval operations. Bangladesh has enhanced its underwater capabilities but requires greater cooperation for maritime security through institutions such as Indian Ocean Rim Association (IORA) and by participating as an observer in QUAD-linked exercises to better position itself for a changing security environment (Hossain, 2018; French Ministry of Armed Forces, 2021).

Flexibility demonstrated by regional middle powers does not violate sovereignty. Vietnam is balancing its relations with Russia, India, and the US to maintain its independence (Chaudhury, 2019). Indonesia's procurement diversification is based on a "free and active" policy. The Philippines is trying to balance security assurances from the US with economic engagement from China. The cases indicate that by selectively aligning on issues, capability can be increased without loss of independence.

Nevertheless, being flexible in how states align themselves is not without risk and can have repercussions, such as backlash from rival powers and unintended entanglement in geopolitical rivalries (Rashid, 2020). For this purpose, Bangladesh needs to develop a transparent strategic framework, diversify procurement, and strengthen multilateral engagement. The calibrated and interest-driven tilt, therefore, is a pragmatic evolution of Bangladesh's defence outlook that enhances its capabilities while maintaining autonomy in a competitive Indo-Pacific environment.

Policy Options and Recommendations

Key Findings

The study finds that Bangladesh's long-standing defence posture, centered on neutrality and non-alignment, is increasingly difficult to sustain in the rapidly evolving Indo-Pacific environment. Intensifying US–China rivalry, India's assertive regional presence, and rising maritime and cyber threats are reshaping the country's strategic surroundings. At the same time, internal constraints such as delayed procurement, limited technological capacity, and a weak defence industrial base highlight the inadequacy of a passive defence outlook.

The research demonstrates that Bangladesh would benefit from a flexible, pragmatic approach involving selective alignments with multiple partners. Comparative cases of Vietnam's diversification, Indonesia's hedging, and the Philippines' dual-track engagement show that smaller states can protect autonomy while enhancing their security. For Bangladesh, a multi-vector strategy is both feasible and increasingly necessary to strengthen defence readiness and maintain relevance in the Indo-Pacific.

Strategic Options for Bangladesh

Bangladesh has four broad strategic pathways in the emerging regional order:

Option 1: Strict Neutrality. Maintains equidistance and avoids deep defence collaboration. While diplomatically safe, it risks strategic inertia, limited access to technology, and exclusion from key security dialogues.

Option 2: Selective Alignment. Engages multiple powers on an issue-specific basis, allowing targeted improvements in ISR, air defence, cyber security, and maritime capabilities. It balances cooperation with autonomy but requires careful diplomacy.

Option 3: Full Alignment with One Power. Provides strong security guarantees and access to advanced technology but risks dependency, reduced autonomy, and entanglement in great-power rivalry.

Option 4: Regional Mini-lateralism. Enhances collaboration through platforms such as Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) and IORA, and helps build confidence and shared security. Limited access to technology and strategic depth.

Final Recommendation: Selective Alignment

In view of the present threats and modernisation needs, the research strongly advocates an interest-driven, selective alignment model. Bangladesh needs to engage with a range of major and middle powers, including the US, China, Turkey, Japan, France, the UK, and South Korea, on specific capability requirements. Joint military exercises, technology acquisitions, cybersecurity partnerships, and participation in multilateral security initiatives are all examples of possible cooperation.

All partnerships need to be formalised through transparent legal frameworks, regular strategic reviews, and institutional oversight to

avoid dependency or the erosion of sovereignty. A modular alignment strategy can deter more effectively, broaden the diplomatic space, and make Bangladesh a proactive player in the Indo-Pacific.

Policy Roadmap for Implementing Selective Alignment

To operationalise selective alignment, Bangladesh must undertake structural reforms:

- Biennial Defence Reviews to examine capability gaps, procurement timelines, and strategic priorities.
- Develop Credible Deterrence by building layers of air defence, MRCA, armed UAVs, and enhanced C4ISR systems, supported by partnerships with Turkey, South Korea, Japan, and China.
- Revised Defence Sourcing Matrix to gradually reduce reliance on China over time while increasing collaboration with Turkey, Japan, South Korea, and some Western vendors.
- Establish a National Security Council (NSC) to ensure unified decision-making on national security and defence issues.
- Appoint a CDS to enable tri-service integration and coherent military advice to the government.
- Establish a Defence Diplomacy Directorate within the Ministry of Foreign Affairs to coordinate international military cooperation.
- Launch Trilateral/Quadrilateral Dialogues focused on maritime security in the Bay of Bengal.
- Advance Cyber and Space Capabilities through partnerships with technologically advanced nations.
- Strengthen Legislative Oversight to ensure transparency and efficiency in procurement.

- Invest in Indigenous R&D through university–military linkages and national defence research centres.
- Expand UN Peacekeeping Engagements to build experience and international credibility.

Conclusion

Bangladesh now stands at a decisive moment in its strategic evolution. The Indo-Pacific region is undergoing profound transformation, driven by sharper great-power rivalries, expanding military footprints, and new technological contestations. For a nation located at the nexus of South and Southeast Asia, these developments have immediate ramifications for national security, economic stability, and long-term strategic autonomy. The evidence presented in this research makes it abundantly clear that a passive, neutrality-based defence posture is no longer sufficient to protect Bangladesh's interests in a more complex environment. Instead the country must adopt an adaptive, forward-looking defence outlook that can respond to both traditional and emerging threats.

Selective alignment provides a balanced and realistic route for Bangladesh to enhance its deterrence posture without the unwanted entanglement in major-power rivalries. By working with a broad array of partners to address specific capability needs, Bangladesh can gain access to advanced technologies, increase operational readiness, and enhance its contribution to regional security networks. The next decade will be key in testing Bangladesh's ability to marshal political consensus, institutional reform, and strategic clarity to carry out this shift. With meticulous planning, sustained investment, and a commitment to safeguarding national sovereignty, Bangladesh can craft a defence posture that is resilient and strategically relevant in the Indo-Pacific.

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Major General Mohammad Kaiser Rashid Chowdhury was commissioned on 16 December 1993 in the Regiment of Artillery. Besides various courses at home, he attended the Advanced Command and Staff Course in the UK; the Gunnery Staff Course in Pakistan; and the Basic Course, including a Language Course, in Turkey. He commanded a Field Regiment of Artillery, an Artillery Brigade, and served as Brigade Major of an operational Artillery Brigade. He was a Platoon Commander at the Bangladesh Military Academy. He also served as an Instructor in the School of Artillery for two tenures totaling three years. He was Chief Instructor of the School of Artillery for about a year. He has served at the Defence Services Command & Staff College, Dhaka, as a member of the Directing Staff and a Senior Instructor for more than 3 years. He was Additional Military Assistant to the Chief of Staff of the Bangladesh Army. Kaiser served as UNMO and SO in UNMIL in 2004 and 2011, respectively. He served as Chief of the Force Generation Service in the Office of Military Affairs at UN Headquarters in New York, USA, for more than 4 years. He is a Graduate of both the National Defence College and the Defense Services Command & Staff College, Mirpur. He attained his master's degree in Defence Studies from King's College, London. He is also a PhD research fellow at Jahangirnagar University, Dhaka, Bangladesh. He was promoted to his present rank in 2026. Major General Kaiser is married and has one son and one daughter.

NDC JOURNAL
Security Through Knowledge

CAUSES AND MITIGATION STRATEGIES FOR RIVER POLLUTION IN PERI-URBAN BANGLADESH: A CASE STUDY OF BALU RIVER, RUPGANJ, NARAYANGANJ

Brigadier General Abul Hasnat Mohammad Sayem, BGBMS, ndc, afwc, psc, MPhil

Introduction

As a riverine country, Bangladesh relies on rivers for its culture, economy, and geography. With over 700 rivers flowing through it, these water bodies are important for agriculture, inland fisheries, transportation, and flood control. However, the same rivers suffer increasing challenges from unplanned urban growth, careless industrial development, and inadequate waste management. As such, water pollution has become a serious concern for environmental management. It also threatens ecosystems, human health, and food security. Peri-urban areas in Bangladesh are defined as transitional zones. They lie between rural villages and urban axes. These are increasingly becoming hotspots for both economic opportunities and environmental stress. Rupganj, in the Narayanganj district near Dhaka, symbolizes a prominent example of such transformations. The area has witnessed rapid industrial expansion, including textiles, dyeing, tempered glass, cement, and chemicals. Several residential projects, such as Purbachol New Town and Jolshiri Housing Project, have significantly altered land-use patterns, shrinking wetlands and increasing pressure on local rivers. Balu River, which passes through Rupganj and merges with the Shitalakkhya, plays a very significant ecological and economic role. It provides water for farming and household use. It also supports fish production and sustains the livelihoods of adjoining communities. However, over the past few decades, the river has been severely stressed by untreated industrial waste, household sewage, agricultural runoff, and rampant dumping of solid waste. Its water quality has worsened to the point that it no longer supports aquatic biodiversity. It also poses

extreme threats to human health. Dealing with the pollution of the Balu River is therefore not only an ecological need but also an urgent social and developmental issue. This study uses the Balu River as a case study to identify the causes of river pollution and to develop area-specific mitigation strategies.

Summary of Literature Review and Research Gap

Peripheral rivers around Dhaka, including the Balu, Shitalakhya, Buriganga, Turag, and Karnaphuli, have experienced very alarming pollution levels over the last few decades (Jamal, 2021; Hasan, 2013). These water bodies serve as important sources for drinking, irrigation, aquaculture, and industrial use, but are widely contaminated by various anthropogenic activities. Sampling at multiple points upstream and downstream of Dhaka's industrial zones revealed significant spatial and seasonal variability (Islam, 2012). It has been observed that water bodies near industrial areas, such as Hazaribagh, are affected by the release of untreated toxic chemicals (Hasan, 2013). Several studies have highlighted seasonal fluctuations in pollution levels, with dry seasons showing higher contaminant concentrations due to reduced flow and dilution capacity. Several studies have reported higher levels of heavy metals and other toxic substances during the dry months than during the monsoon season (Islam, 2012; Jamal, 2021; Hasan, 2014). A comprehensive review of the existing literature reveals a consensus among researchers on the need for a multipronged, integrated approach to mitigating river pollution. This is particularly relevant in the context of the Balu River, where pollution arises from complex interactions among industrial, domestic, and agricultural sources. Most previous studies have analyzed general pollution trends, focusing on industrial effluents, municipal waste, and seasonal variations (e.g., Hadiuzzaman, 2006; Islam, 2012; Rahman, 2016; Hasan, 2013, 2014). There is limited research on effective community-based and policy-driven mitigation strategies for the Balu River. This study aims to fill this gap by:

- Identifying the localized causes of pollution in the Balu River, Rupganj, through stakeholder perspectives.

- Proposing context-specific, sustainable solutions integrating scientific, policy, and community-based approaches.

Research Objectives

The primary objectives of this research are:

- To identify and categorize the major sources of pollution in the Balu River.
- To evaluate the types and levels of pollutants present in the river water.
- To evaluate the effects of industrial waste, domestic sewage, and agricultural runoff causing water pollution.
- To propose mitigation strategies and policy recommendations for reducing the pollution in the Balu River.

Research Methodology

This study used a mixed-methods approach, combining field surveys, water quality analysis, and stakeholder interviews to generate both quantitative and qualitative insights. The design ensured the integration of data, enabling a broad understanding of the causes and mitigation strategies for pollution in the Balu River in Rupganj, Narayanganj.

Data Collection Methods

Water samples have been collected from five sites along the Balu River, selected to represent peri-urban influences. These sites included areas near Purbachal New Town and Jolshiri Abashon, as well as markets and agricultural lands transitioning into residential areas, and zones affected by industrial and agricultural discharges. The samples were tested for pH, DO, total dissolved solids (TDS), heavy metals (lead, mercury, arsenic, and chromium), and bacterial contamination (fecal coliforms). In addition, systematic observations have been conducted to identify the major sources of pollution, including industrial effluent discharge points,

domestic waste disposal sites, sewage disposal facilities, and agricultural runoff channels. One focus group discussion has been conducted at the Bangladesh Tempered Glass Industry, involving the owner, a manager, and an engineer. A key informant interview has been conducted with an environmental expert from MIST. This interview provided an in-depth insight into the drivers of pollution in the peri-urban settings and the feasibility of mitigation strategies. A structured survey was conducted among 100 stakeholders (Table 1) to assess the extent of river water usage in daily life and industrial processes. This provided important context on the socio-economic dependence on the Balu River.

Table 1: Stakeholders regarding Water Usage in the Balu River Areas

Stakeholder Group	Primary Water Usage	Sample Size
Local Communities (Households)	Drinking, cooking, bathing, and sanitation	35
Farmers & Fishermen	Irrigation, fishing	25
Industries (Tempered Glass Factory, Ready-Mix Factory)	Production processes, cooling	25
Municipal Authorities (Narayanganj City Corporation, Rupganj Upazila Administration)	Waste & sewage management	15
Total		**100**

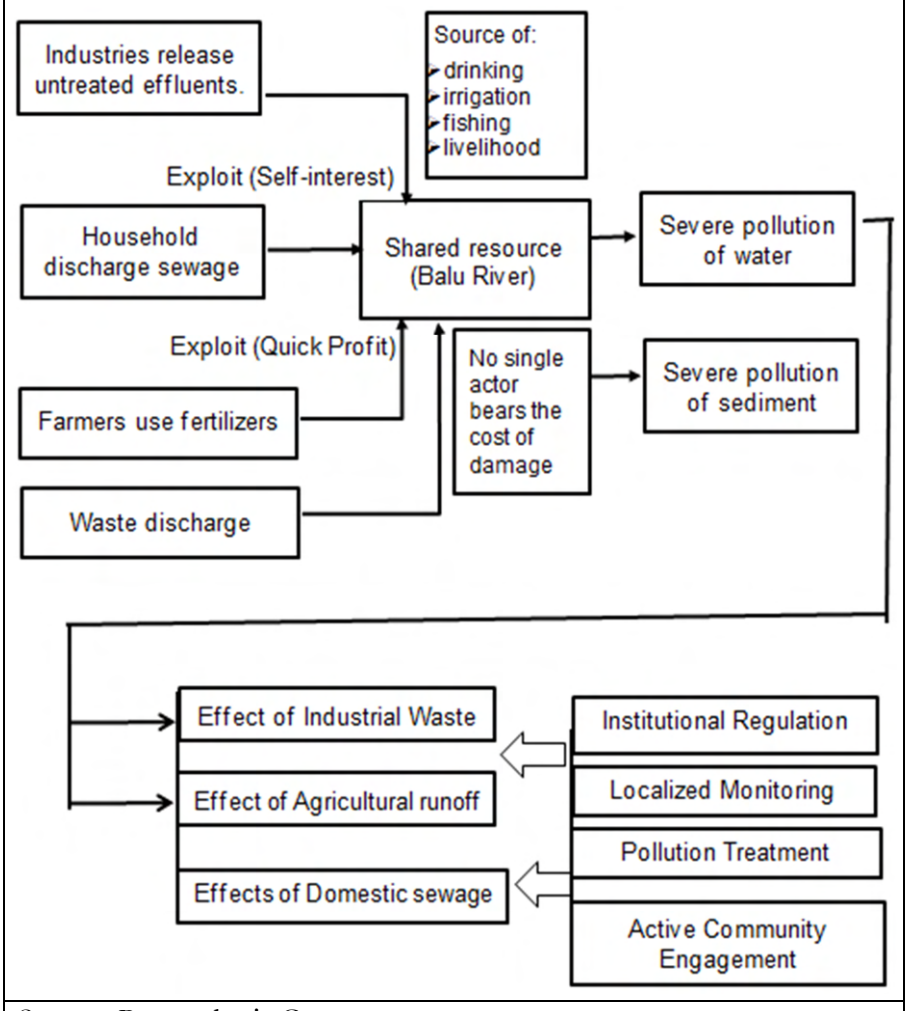
Source: Researcher's Construct

Theoretical Framework

The theory provides a strong basis for understanding how pollution is exacerbated in the Balu River in peri-urban Rupganj; several actors, including industries that release untreated effluents, households that discharge sewage, farmers who use fertilizers and pesticides, and municipal authorities struggling with waste management, continuously exploit the river for immediate gains. Because no single actor bears the

full cost of such severe damage, the overall effect is serious pollution of water and sediments. The problem is that while the river remains an important resource for drinking, irrigation, fishing, and livelihoods, its long-term sustainability is threatened by ignorance of responsibility and poor enforcement.

Figure 1: Theoretical Framework



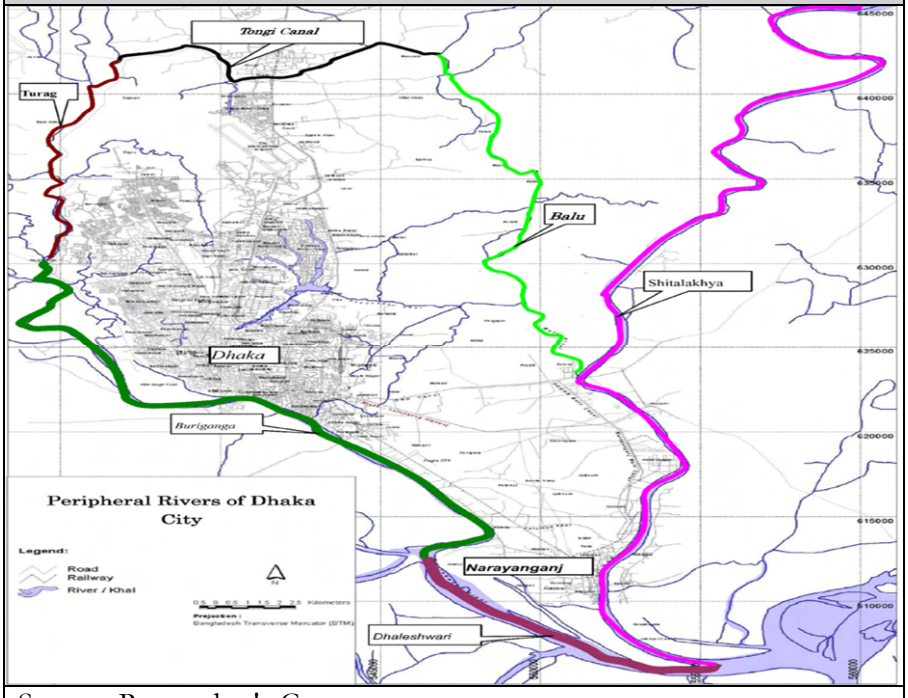
Source: Researcher's Construct

The above theoretical framework illustrates the importance of institutional regulation, community-based resource management, and policy interventions in resulting in such outcomes. From the perspective of the Balu River, this signifies that solutions must include government enforcement of environmental regulations, localized smart monitoring, industry-specific pollution treatment, and dynamic community engagement in river governance. Thus, the Tragedy of the Commons explains why unregulated exploitation persists in peri-urban Bangladesh and underscores the importance of collective responsibility in maintaining the river's long-term ecological health.

Study Area Profile

Bangladesh's capital, Dhaka, is situated on the northern bank of the Buriganga River and is bordered to the west by the Turag, to the north by the Tongi Khal, and to the east by the Balu.

Figure 2: Major Rivers of Dhaka City in Bangladesh



Source: Researcher's Construct

The study area of the 'Balu River', Dhaka district, flows through the Jolshiri Housing Area, and the Purbachal Model Town is located between 23°48'20.6" N to 23°46'53.5" N Latitudes and 90°29'05.6" E to 90°41'15.9"E Longitudes. The GPS locations are listed in Table 2 and illustrated in Figure 3.

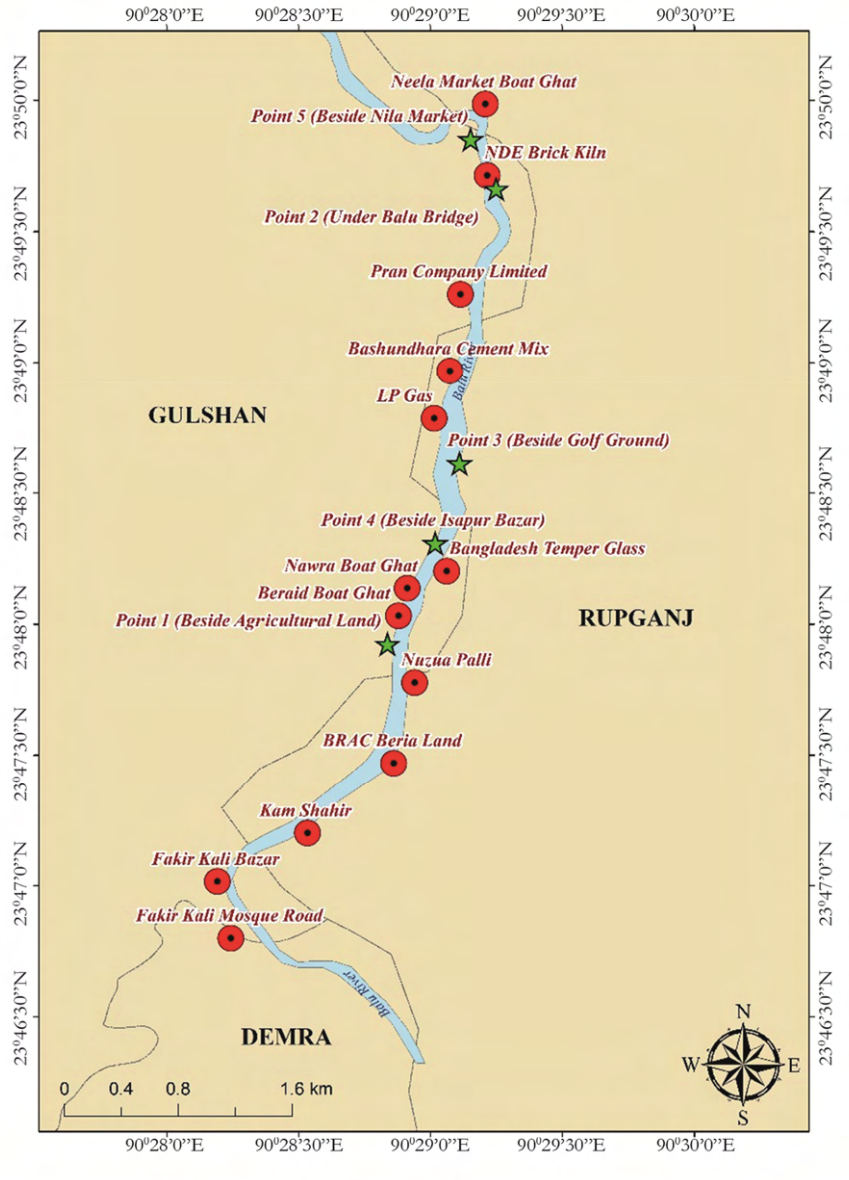
Table 2: Sampling Location

Location	Latitude	Longitude
Location 1	23°48'20.6"	90°29'05.6"
Location 2	23°48'30.7"	90°29'05.6"
Location 3	23°48'36.3"	90°29'05.3"
Location 4	23°48'39.7"	90°29'06.7"
Location 5	23°48'42.5"	90°29'08.5"

Source: Researcher's Construct

Samples have been taken at 1-1.5 km intervals near industries, agricultural zones, and habitations, enabling accurate mapping of pollution, tracing pollution sources, and understanding human-environment interactions in peri-urban areas.

Figure 3: Study Area Profile



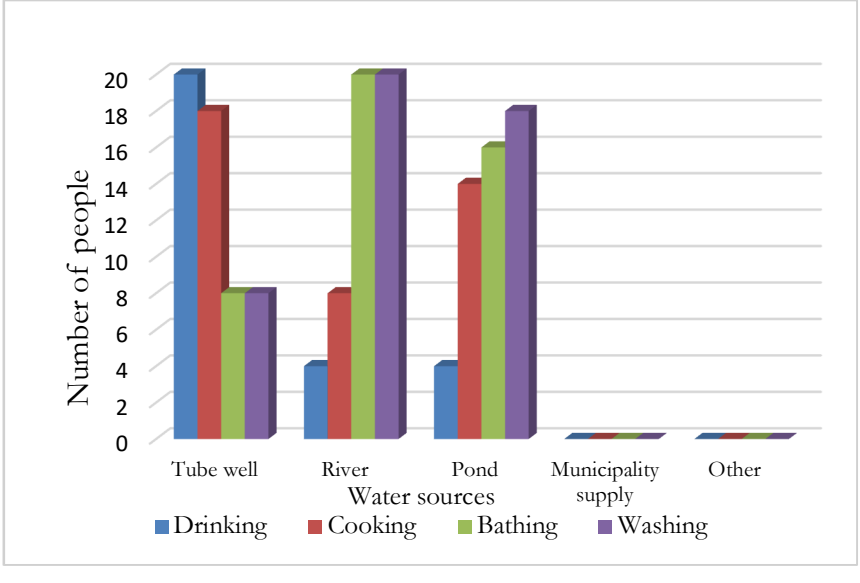
Source: Researcher's Construct

Identification of Major Sources of Pollution

The Balu River, which flows through the rapidly urbanizing peri-urban areas of Rupganj in Narayanganj, serves as a crucial ecological and socio-economic resource for the surrounding communities. However, in recent decades, the river has been under significant pressure from pollution stemming from industrial expansion, population growth, and inadequate environmental controls. It systematically identifies the key sources of pollution along the Balu River and categorizes them by origin, characteristics, and environmental impact. In the process, it undertakes field surveys, stakeholder interviews, and laboratory tests.

A survey was conducted among 20 local householders to assess their primary water sources. The results, as shown in Figure 4, indicate that the majority of respondents rely on river water for drinking, cooking, bathing, and washing. This suggests either the absence of such infrastructure or its inaccessibility in the area surveyed.

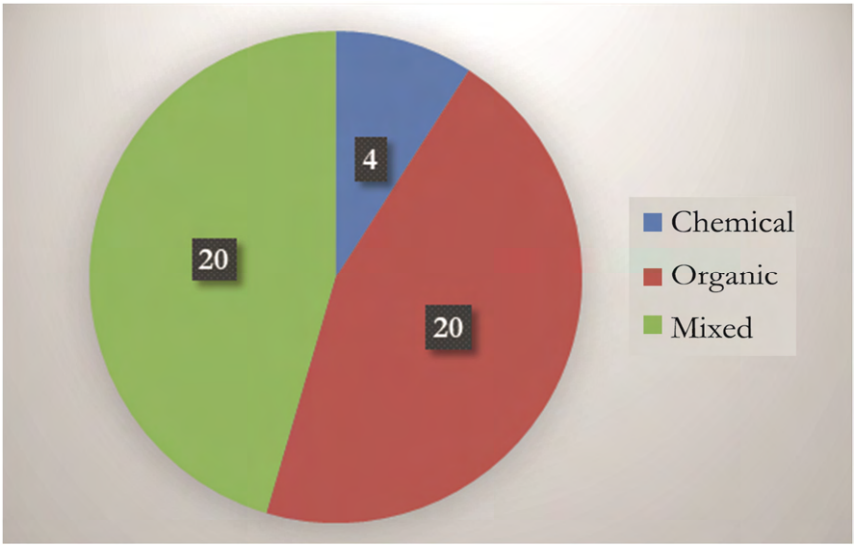
Figure 4: Primary Source of Water



Source: Researcher's Construct

A water-use survey was conducted among farmers in the Rupgonj area to identify the localized causes and impacts of pollution in the Balu River. As part of this survey, forty-four farmers were interviewed regarding the types of fertilizers and pesticides they use (categorized as chemical, organic, or mixed). The findings indicate that the majority of farmers rely on organic or mixed pesticides, while only a small number reported using chemical pesticides.

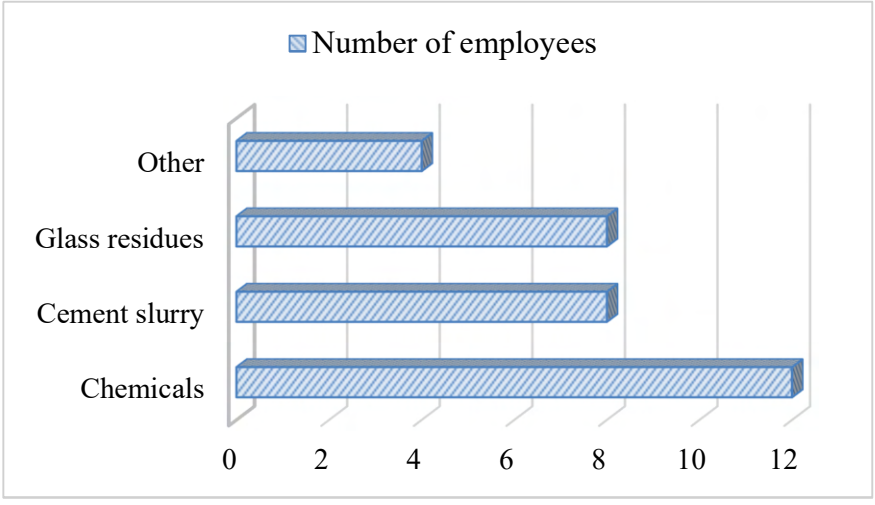
Figure 5: Use of Fertilizers/Pesticides



Source: Researcher's Construct

To identify the kinds of waste discharged into the Balu River from nearby industries, consultations were conducted with 20 employees. The findings indicate that chemicals are the most frequently discharged waste type, as reported by 12 employees. Eight employees mentioned cement slurry, and four respondents identified glass residue as being discharged into the river.

Figure 6: Type of Waste Discharged into Balu River

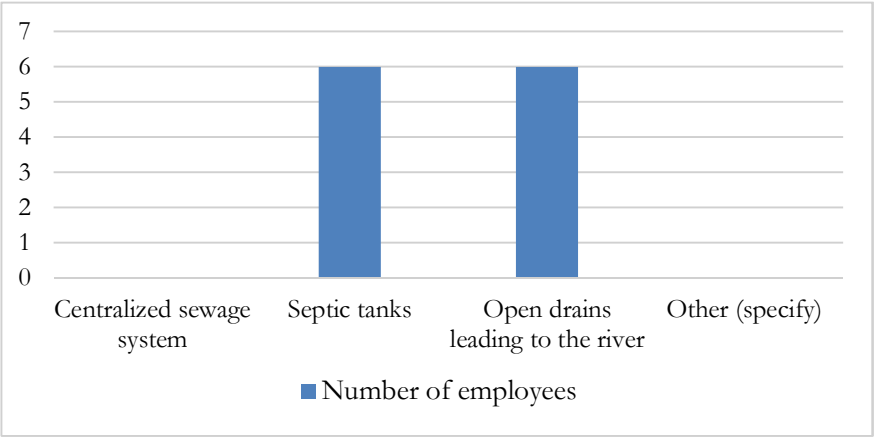


Source: Researcher's Construct

To evaluate household access to a piped water supply in the Rupganj area, ten residents were interviewed. The results depict that all respondents estimated that fewer than 25% of households in the area have access to a piped water supply. None of the participants believed that coverage surpassed this level.

A survey was conducted to understand how domestic sewage is managed in the Rupganj area. The findings reveal that septic tanks and open drains that discharge directly into the river are the primary methods of domestic sewage management in the area, with six respondents reporting the use of each system. No participants indicated the presence of a centralized sewage system or other methods.

Figure 7: Domestic Sewage Management System

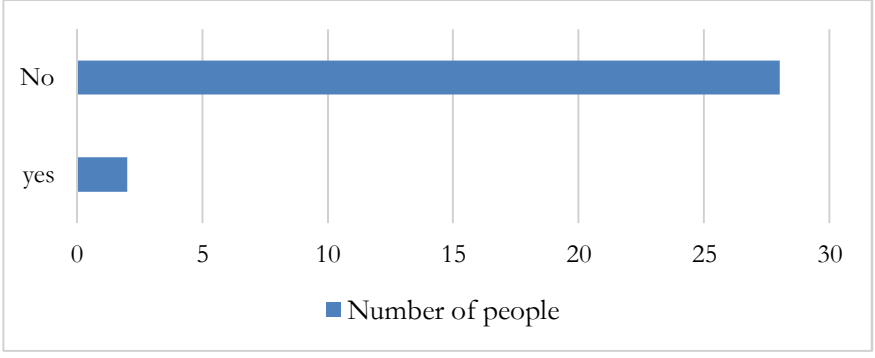


Source: Researcher's Construct

Public Awareness

A survey of 30 individuals was conducted to assess their awareness of government or local programs aimed at improving water quality. The majority (28 out of 30, or approximately 93%) stated that they are uninformed of any such initiatives. This highlights a significant gap in communication or outreach about water quality efforts.

Figure 8: Awareness of Local People of any Government/Community Programs



Source: Researcher's Construct

The Balu River's pollution can be broadly grouped into several categories based on a ground survey conducted in Rupganj. In each category, the multifarious interactions between industrial processes, human activity, and natural elements that harm aquatic ecosystems and endanger human health are replicated. Organic pollutants in the Balu River originate from domestic and agricultural sources. They consist of biodegradable materials. These substances increase the river's Biological Oxygen Demand (BOD). As such, it reduces the dissolved oxygen that aquatic life needs, thereby threatening fish and other aquatic organisms. Inorganic pollutants in the Balu River combine with persistent, non-biodegradable substances that can accumulate in sediments and bioaccumulate in aquatic organisms, causing long-term environmental risks. They are generated from industrial chemicals, chemical residues, and inorganic fertilizers.

Additionally, nutrient-based pollutants, including nitrogen and phosphorus compounds, play a significant role in increasing eutrophication in the Balu River. They are generated from excess fertilizers, sewage, etc. The presence of pathogens in the Balu River poses a severe public health concern, especially for communities that rely on river water for domestic use and livelihoods. It is generated by untreated sewage, open defecation, and poor sanitation. Industrial pollutants in the Balu River originate mainly from factories operating in and around Rupganj, often with insufficient regulatory oversight. Improper management of solid waste is another important source of pollution in the Balu River, contributing to both physical and chemical degradation. Agricultural practices in the Balu River basin discharge pollutants that degrade water quality and affect its physical characteristics.

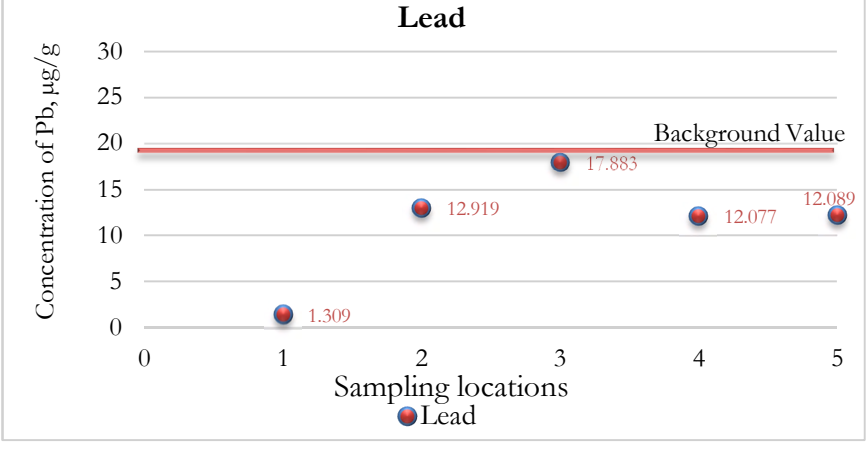
This categorization expresses the multifaceted nature of pollution affecting the Balu River, showing contributions from domestic, industrial, agricultural, and municipal sources. Visualizing these pollutant types and their sources provides an important basis for developing targeted and effective mitigation strategies to restore and protect the river's health.

Pollutants Available in the Water and Sediments of the Balu River

The pollution in the Balu River can be seen through the lens of the Tragedy of the Commons, where shared use has led to its overexploitation. Industries, households, and farmers each prioritize their own needs, irresponsibly dumping waste into the river. It therefore aims to thoroughly examine the types, concentrations, and environmental presence of pollutants in both the water column and the riverbed sediments of the Balu River.

The average lead (Pb) concentration in Balu River sediments was 11.25 µg/g. The highest concentration was recorded at sampling point 3 (17.88 µg/g), while the lowest was at point 1 (1.3 µg/g). These values are largely lower than the global average for surface rocks (16 µg/g) and the background level for Bangladesh (20 µg/g), except at point 3, where the concentration slightly exceeds the global average (Figure 6). Overall, Pb levels in the river indicate a relatively low risk of lead contamination. However, the elevated concentration at point 3 may indicate localized industrial discharge, likely from nearby factories and manufacturing units. Although current levels do not indicate widespread contamination, the presence of Pb, even at moderate concentrations, underscores the need for regular monitoring and stricter pollution control measures to prevent potential public health risks.

Figure 9: Lead at different Sampling Locations

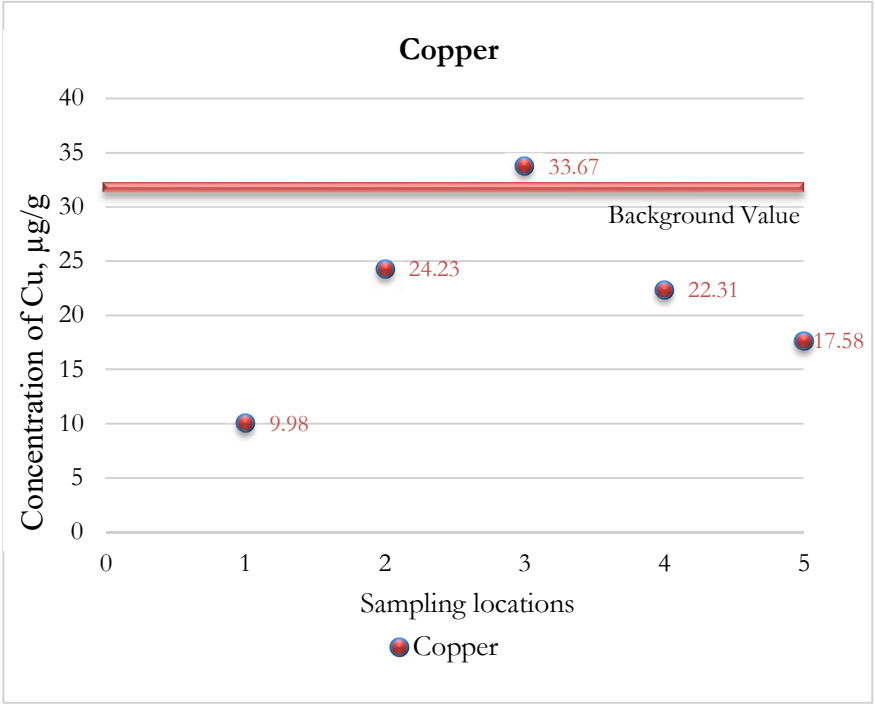


Source: Researcher's Construct

Copper

The average concentration of Cu (21.56 µg/g) in the Balu River sediments, although generally below the Bangladesh background value of 32 µg/g, indicates moderate contamination. However, the elevated concentration at point 3 (33.67 µg/g), which exceeds the national background threshold, suggests a potential localized pollution source, possibly from industrial discharge, untreated sewage, or runoff from nearby urban areas.

Figure 10: Copper at different Sampling Locations



Source: Researcher's Construct

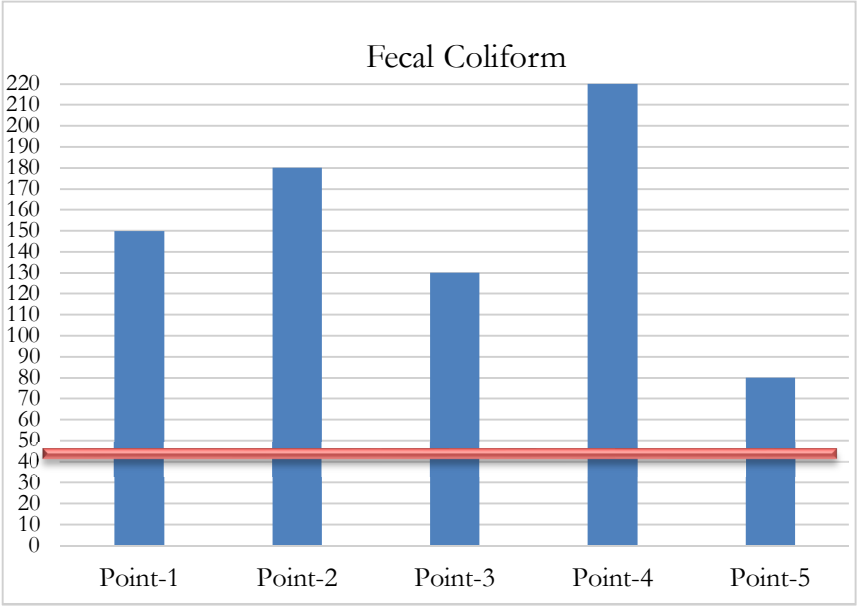
This spatial variability highlights the non-uniform distribution of pollution sources along the river, suggesting that certain hotspots may pose significant ecological and public health risks. The presence of Cu at

elevated levels, even if limited to a specific site, can accumulate in the aquatic food chain and affect sediment quality. Therefore, continuous, location-specific monitoring is essential for tracking trends over time, identifying emerging contamination zones, and implementing targeted mitigation strategies. Regular surveillance will also help assess the effectiveness of pollution control measures and ensure the long-term health of the Balu River ecosystem.

Fecal Coliform

The mean Total Fecal Coliform concentration for five sampling points was 152 CFU/100 mL. All observed FC values exceeded the Bangladesh standard of 50 CFU/100 mL (Figure 11). Therefore, the water of the Balu River is found to be harmful due to FC pollution. Fecal coliform levels in the Balu River increased due to several factors, including inadequate sanitation systems in Nilla Market and Icchapur Bazar. This is complemented by agricultural runoff, as sampling points are positioned near these localities. The elevated fecal coliform levels in the Balu River, which exceed environmental standards, pose a significant public health risk, particularly for communities that rely on the water for domestic or agricultural purposes. This pollution, linked to inadequate sanitation infrastructure in local markets and agricultural runoff, underscores the persistent need for improved wastewater management, enhanced sanitation facilities, and greater community awareness to prevent the spread of waterborne and other diseases in local areas.

Figure 11: Fecal Coliform at different Sampling Points



Source: Researcher's Construct

The analysis of water and sediment samples from the Balu River in Rupganj, Narayanganj, depicts alarming levels of pollution, primarily driven by industrial discharge and sewage inflows.

- **Heavy Metal Contamination in Sediments**
  - **Lead (Pb)** was found at 11.25 µg/g, which is generally below the background value for Bangladesh. However, at one point it exceeded the safe limit. This is mainly attributed to untreated industrial effluents.
  - **Copper (Cu)** levels reached 33.67 µg/g, exceeding acceptable limits and posing ecological and human health risks due to its toxicity and persistence.

- **Arsenic (As)** was also found at a moderate level, indicating long-term contamination, likely from industrial and perhaps agricultural sources.
- **Chromium (Cr)** concentration was found at 78.84 μg/g, a highly harmful level, often linked to tanneries upstream, textile, and metal processing industries.

- **Microbial Contamination in Water**
  - The fecal coliform count was measured at 152 CFU/100 ml, far above the WHO-recommended safe limit, depicting significant sewage contamination.
- **Key Pollution Sources**
  - **Raw sewage** from Nilla Market**,** Icchapur Bazar, and several poorly constructed households in neighboring locations directly discharge into the river, contributing to microbial and organic pollution.
  - **Industrial wastewater**, often discharged without adequate treatment, remains a significant source of heavy metal contamination.
- **Environmental and Public Health Implications**
  - The findings point to a critically polluted river system, with heavy metals accumulating in sediments and harmful microbes present in the water column.
  - This pollution poses serious threats to aquatic biodiversity, human health, and the livelihoods of communities that depend on the river.

Immediate, concerted measures are necessary to monitor, control, and remediate pollution sources to prevent long-term ecological harm and protect public health.

Effects of Industrial Waste, Agricultural Runoff and Domestic Sewage in River Water

Discharge of untreated or poorly treated industrial effluents, including contaminated chemicals, heavy metals, and organic pollutants, as well as untreated domestic sewage from densely populated settlements and agricultural activities along the riverbanks, affects the water and sediment quality of the river. These pollutant sources lead to declines in dissolved oxygen, bioaccumulation of hazardous substances, eutrophication, and reduced capacity of the river to support aquatic life.

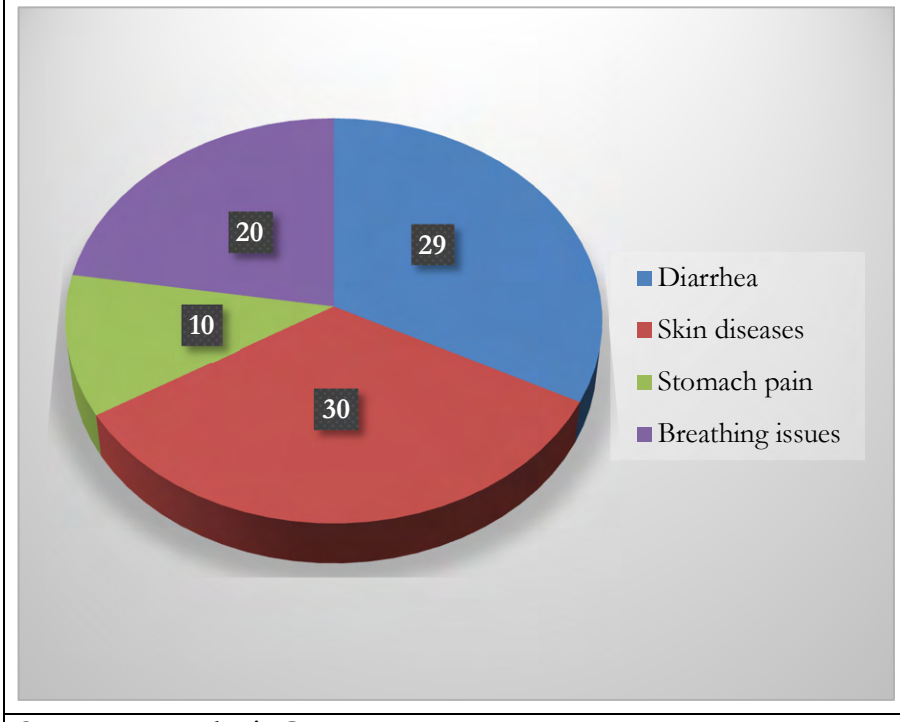
Lack of Dissolved Oxygen (DO)

The mean DO concentration for the five sampling points was 0.33mg/L. The DO at all sites was very low. This suggests that the decrease in DO in Balu is primarily due to its proximity to Dhaka's urban areas. Such low values do not bolster the survival of aquatic life. As per Bangladesh Standards (Recreational Purposes), the accompanying requirement for DO is 5. The measured values were much lower than the Bangladesh standard of 5 (Figure 15). Dissolved oxygen levels in the Balu River are declining due to the discharge of domestic sewage and untreated waste runoff. The critically low dissolved oxygen levels in the Balu River, far below the Bangladesh standard of 5 mg/L, threaten the survival of aquatic life and disrupt the river's ecological balance. This severe depletion, driven by untreated domestic sewage and urban waste discharges, underscores the immediate need for wastewater treatment interventions and stricter pollution control to restore and protect the river's health.

Effect on Health

A survey of 30 residents was conducted to assess how water quality affects their health. The results show that nearly all respondents suffered skin diseases and diarrhea as major health issues linked to poor water quality. Breathing problems were also prominent, affecting 20 respondents, while 10 reported stomach pain. No other health concerns were noted beyond those listed.

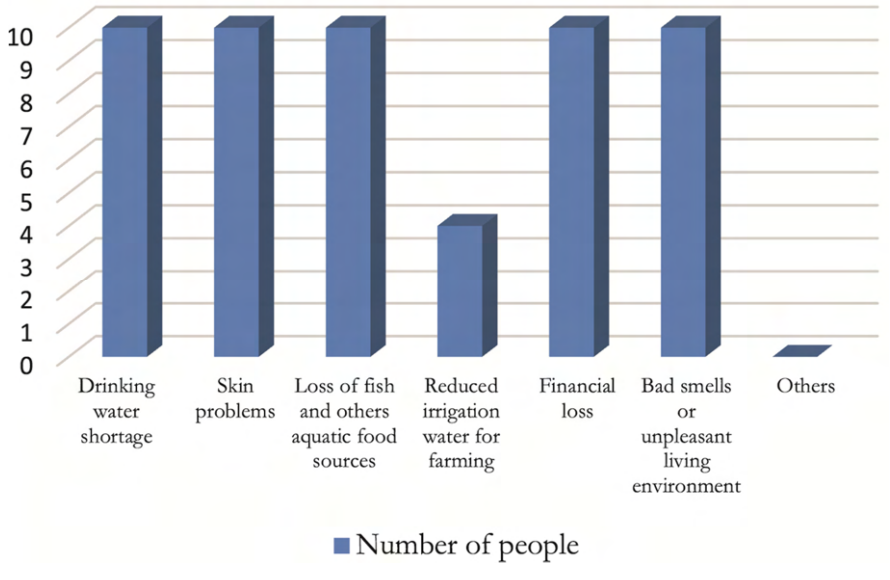
Figure 12: Health Issues related to Water Pollution



Source: Researcher's Construct

As part of the survey, ten households were asked about how pollution of the Balu River has affected their daily lives. The findings indicate that river pollution has had widespread and severe impacts on households, including drinking water shortages, skin-related health issues, loss of fish and other aquatic food resources, financial losses, and an unpleasant living environment due to foul odors. A smaller number of respondents also reported reduced availability of irrigation water for farming.

Figure 13: Graphical Representation of how Pollution of the Balu River Affected their Daily Life

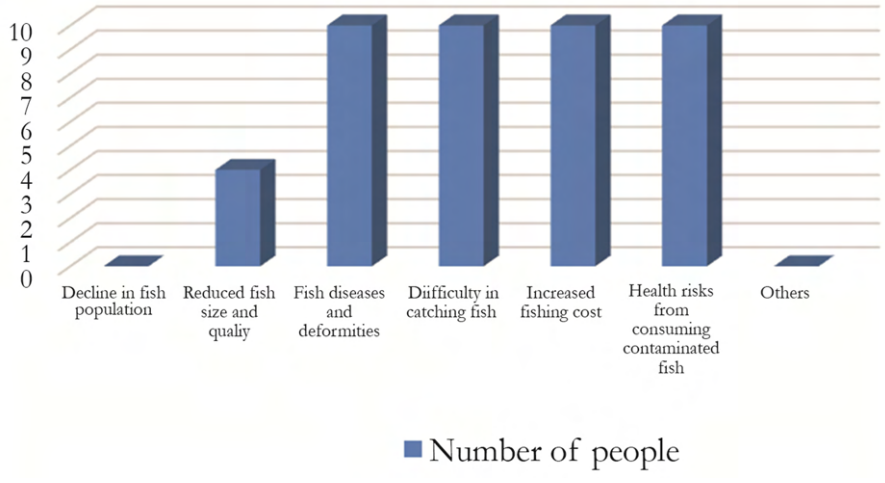


Source: Researcher's Construct

Human Health Hazards

As part of the survey, ten fishermen were asked about the most significant impacts of Balu River water pollution on fishing, based on their personal experience. The findings indicate that fishermen perceive water pollution as severely affecting their livelihood, particularly through the spread of fish diseases and deformities, increased difficulty catching fish, higher fishing costs, and health risks associated with consuming contaminated fish. A smaller number also noted reduced fish size and quality, while none reported a direct decline in overall fish population.

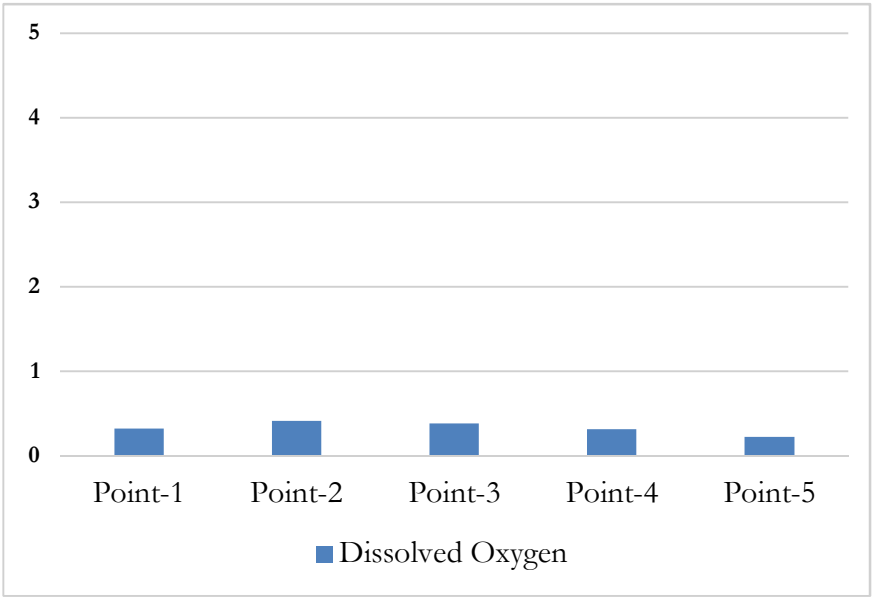
Figure 14: Greatest Impacts of Balu River Water Pollution on Fishing



Source: Researcher's Construct

The impacts of industrial waste, agricultural runoff, and domestic sewage portray important insights for developing targeted mitigation strategies for the Balu River. The very low dissolved oxygen levels, foul odors, and health issues associated with industrial discharges underscore the urgent need to enforce stricter effluent treatment regulations, build effective wastewater treatment facilities, and encourage cleaner production methods. Agricultural runoff, which leads to reduced fish populations, increased salinity, and chemical contamination, underscores the need to support sustainable farming practices, including the use of organic fertilizers and the creation of buffer zones along riverbanks. Besides, the spread of waterborne diseases and livelihood disruptions caused by untreated domestic sewage urgently call for investments in improved sanitation infrastructure, proper drainage systems, and raising public awareness about waste management. To address these impacts, policymakers and stakeholders must prioritize implementing practical, evidence-based solutions to restore the ecological balance of the Balu River and improve the health and well-being of local communities.

Figure 15: Dissolved Oxygen at different Sampling Points



Source: Researcher's Construct

The impacts of industrial waste, agricultural runoff, and domestic sewage provide important insights for developing targeted mitigation strategies for the Balu River. The very low dissolved oxygen levels, foul odors, and health issues associated with industrial discharges underscore the urgent need to enforce stricter effluent treatment regulations, build effective wastewater treatment facilities, and encourage cleaner production methods. Agricultural runoff, which leads to declines in fish populations, increased salinity, and chemical contamination, underscores the need to support sustainable farming practices, including the use of organic fertilizers and the creation of buffer zones along riverbanks. Besides, the spread of waterborne diseases and livelihood disruptions caused by untreated domestic sewage urgently call for investments in improved sanitation infrastructure, proper drainage systems, and raising public awareness about waste management. To address these impacts, policymakers and stakeholders must prioritize implementing practical,

evidence-based solutions to restore the ecological balance of the Balu River and improve the health and well-being of local communities.

Mitigation Strategies

Efficient and effective mitigation of river pollution in peri-urban areas such as Rupganj requires a comprehensive, concerted approach that considers the multidimensional sources and the complex socio-economic dynamics surrounding the Balu River. Continuous industrial discharges, domestic sewage, solid waste, and agricultural runoff, often in the absence of adequate environmental regulation, require concerted action across multiple sectors. Strategies must address immediate pollution reduction while also laying the foundation for long-term sustainability. Therefore, the mitigation measures need to be categorized into short-term, long-term, and supportive/other strategies, each serving a unique function in the restoration and conservation of the Balu River.

Short-term Strategies

To quickly reduce water pollution in the Balu River, it is necessary to emphasize preventing new pollution and improving the river system's existing water quality.

Based on the survey, interview, and detailed findings, the short-term strategies are highlighted below:

- **Enforcement of Industrial Waste Regulations**
    - Implement strict regulations requiring industries to install and operate Effluent Treatment Plants (ETPs).
    - Conduct routine inspections and audits of industrial discharge systems.
    - Introduce polluter-pay principles and enforce penalties for noncompliance.

- **Domestic Sewage Management**
  - Develop localized sewage treatment systems (e.g., decentralized wastewater treatment).
  - Ensure household-level connections to treatment units wherever possible.
  - Promote retrofitting of existing septic tanks and converting open drains into closed systems.
- **Stormwater and Drainage Management**
  - Design and implement an integrated stormwater management plan to prevent runoff contamination.
  - Introduce constructed wetlands or bioswales to filter stormwater before it naturally enters the river.
- **Agricultural Runoff Control**
  - Promote best management practices (BMPs) such as contour farming, use of organic fertilizers, and regulated application of chemical inputs.
  - Promote vegetative buffer zones along riverbanks to decrease nutrient and pesticide runoff.
- **Solid Waste Management**
  - Strengthen municipal solid waste collection and processing systems.
  - Ban open dumping near water bodies; develop sanitary landfills or recycling facilities.
  - Initiate community-level composting and recycling programs.

- **Awareness and Community Engagement**
  - Launch education and outreach programs to raise awareness about river pollution and health hazards.
  - Engage community people through River Watch Committees, clean-up efforts, and school-based programs.
  - Residents' interest (as found in surveys) in participatory planning and behavior-change campaigns must be leveraged.

Long-term Strategies

A concerted approach that includes policy, technology, and community engagement is essential for effective long-term control of river water pollution. Policy measures can establish a clear regulatory framework and standards, while technological advancements can help detect and treat pollution. Community participation fosters a sense of responsibility and encourages sustainable practices.

- **Integrated Water Resource Management (IWRM)**

  IWRM strategies should be formulated and implemented with consideration of the entire watershed, including the various sources of water pollution and their impacts on the river ecosystem. This can encompass water pricing and incentives to reduce water usage.

- **Encouraging Sustainable Practices**

  Sustainable agricultural practices, such as reduced use of pesticides and fertilizers, should be incentivized to minimize runoff discharged into rivers. This can involve providing farmers with technical assistance and subsidies for implementing eco-friendly approaches.

- **Pollution Control Incentives**

  Economic incentives, such as tax breaks or subsidies, need to be introduced to decrease pollution. These can inspire industries and businesses to adopt pollution control technologies and practices, encourage voluntary compliance, and invest in pollution prevention.

Other Strategies

- **Advanced Wastewater Treatment**

  Progressive wastewater treatment technologies, such as membrane bioreactors and ozone treatment, can be effectively adopted to eliminate pollutants from wastewater before it is discharged into rivers.

- **Pollution Monitoring and Detection**

  Modern sensor technologies, such as remote sensing and drones, can be used to monitor river water quality and identify pollution sources in real time. This enables a fast response and prevents further pollution.

- **Smart Water Management**

  As part of smart water management systems, water meters and leak detection technologies should be incorporated to reduce water loss and enhance distribution efficiency. This may help reduce overall water demand and minimize the amount of wastewater that requires treatment.

- **Community-Based Clean-up and Restoration**

  Community clean-up and restoration projects may be undertaken to improve the river ecosystem. This may involve cleaning up waste materials, planting trees, and restoring riparian areas.

- **Building Partnerships**

  It is essential to establish partnerships with government agencies, non-governmental organizations, and community groups to reduce river water pollution effectively. This may involve pooling resources, sharing knowledge, and working collaboratively to achieve desired goals.

Recommendations and Conclusion

Conducted field surveys, literature reviews, and stakeholder observations revealed the main sources, types, and effects of pollution, while also formulating effective mitigation strategies. The results delineate the need for coordinated action, supported by both top-down policies and community-driven initiatives. According to the research findings, a wide range of mitigation strategies have been proposed. However, a few critical and high-priority recommendations are highlighted below for immediate and strategic action.

First, the most impactful intervention is the immediate, strict enforcement of industrial wastewater treatment plants. All polluting industries along the Balu River must be mandated to install and operate functional Effluent Treatment Plants (ETPs) immediately.

Second, small-scale, localized solutions such as constructed wetlands or anaerobic baffled reactors should be implemented within residential clusters. These systems can significantly reduce organic loads and pathogens before wastewater reaches the river.

Third, critical action is needed to improve solid waste management in communities near the river. This includes strengthening the municipal waste collection system, encouraging household waste segregation, promoting composting of organic waste, and ensuring industrial solid waste is disposed of safely in controlled environments.

Fourth, establishing an integrated river governance mechanism is indispensable. A dedicated Balu River Basin Management Committee must be formed, involving representatives from the Department of Environment, Water Development Board, local government bodies, Non-Government Organizations (NGOs), and local community groups.

Finally, local community involvement must be made a keystone of river restoration. Public awareness programs, environmental education in schools, and the formation of local "river watch" groups can empower residents to take ownership of the river's ecological health.

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ADDRESSING SECURITY CHALLENGES OF THE DISTRESSED FORCIBLY DISPLACED MYANMAR NATIONALS IN BANGLADESH AND PREVENTION OF TRANSNATIONAL CRIMES: A QUEST FOR GLOBAL PEACE EFFORTS

Brigadier General Mohammad Raisul Islam, ndc, afwc, psc

Introduction

The Forcibly Displaced Myanmar Nationals (FDMN) crisis has evolved into a major humanitarian and security challenge for Bangladesh and the wider South and Southeast Asian region. The prolonged stay of FDMN in congested camps since 2017 has raised concerns about social stability and cross-border crimes. Wolf (2014) confirms that the crisis is linked to trafficking, drug smuggling, and other transnational criminal activities. Human Rights Watch (HRW, 2020) shows that limited livelihood options, weak governance, and unclear legal status have increased the FDMN's vulnerability to exploitation by organized crime groups.

The crisis persists as Myanmar continues to deny safe repatriation and regional cooperation remains weak. Despite Bangladesh's commendable humanitarian response, the strain on its security, economy, and environment is immense. This study examines the intersection of displacement, security threats, and transnational crimes, emphasizing the urgency of pragmatic governance, stronger regional collaboration, and global diplomatic engagement for a durable and peaceful resolution.

Problem Statement

Despite Bangladesh's remarkable humanitarian commitment in hosting over one million FDMN, the protracted crisis has created major security, governance, and socio-economic challenges. The lack of legal status,

livelihood restrictions, and overcrowded camps have heightened vulnerability to recruitment by criminal and extremist groups. This growing threat reflects rising violent crimes, drug trafficking, and organized criminal networks, particularly in Ukhia and Teknaf.

Declining humanitarian aid and food cuts have worsened desperation. Existing studies often separate humanitarian and security aspects, overlooking their interconnection. Regional and global actors face resource and political constraints. Without integrated governance linking protection, security, and regional cooperation, Bangladesh risks enduring instability, donor fatigue, and a "lost generation" vulnerable to criminal and extremist exploitation.

Significance of the Research

This research builds a comprehensive framework linking forced displacement with security risks, showing how prolonged refugee crises, socio-economic deprivation, and weak governance foster instability and transnational crime. It enhances understanding of how the FDMN crisis impacts not only Bangladesh but also regional and global security. The findings will help policymakers strengthen law enforcement, governance, and social policies while balancing humanitarian and security priorities.

Regional actors can use the insights to improve cooperation against cross-border crimes and support sustainable repatriation strategies. By analyzing criminal networks, the study helps improve border security, intelligence sharing, and anti-trafficking measures. It also contributes to academic discourse on migration, security, and governance, enriching research on statelessness and conflict resolution.

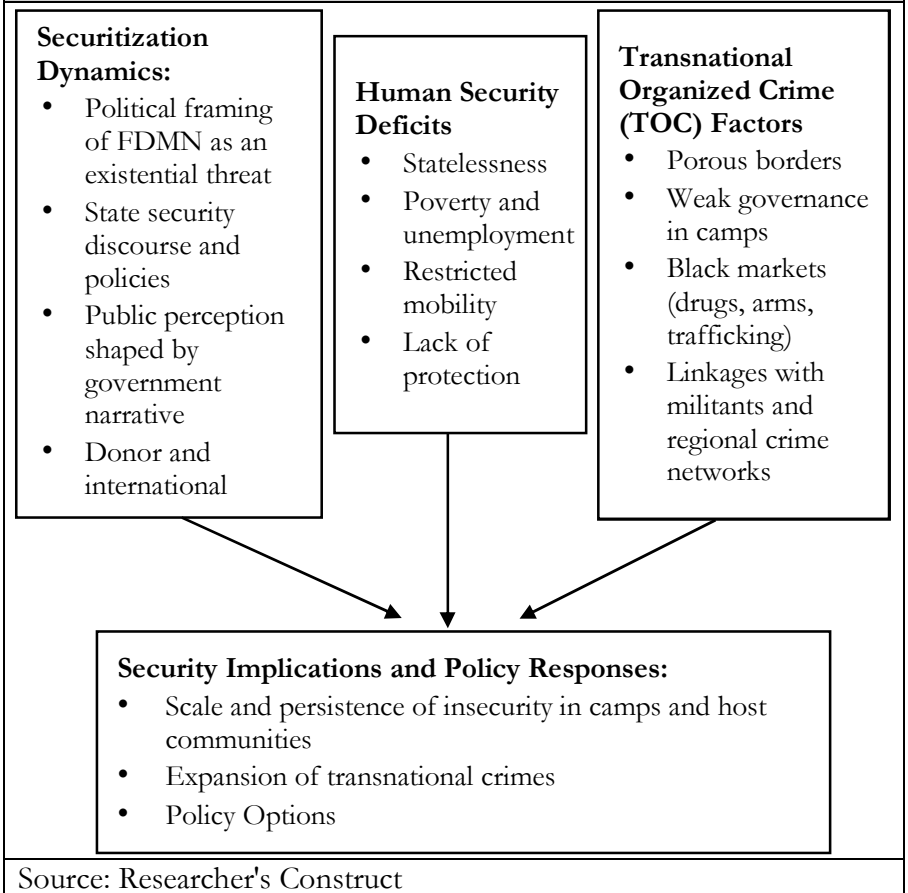
Research Methodology

This study employs a mixed-methods approach, combining qualitative and quantitative analyses to evaluate the multidimensional impacts of the FDMN crisis. Primary data were collected through field observations, interviews with government officials, humanitarian actors, and local community representatives, and surveys of both refugees and host communities. Secondary data were gathered from scholarly articles, government reports, UN and NGO publications, and policy briefs.

Data analysis involved thematic coding for qualitative inputs to identify patterns in governance, security, and socio-economic impacts. Quantitative data were analyzed using statistical tools to assess resource strain, environmental degradation, and incidence of security-related challenges. Triangulation of data sources ensured the reliability and validity of findings.

Analytical Framework. The Framework is shown below:

Figure 1: Analytical Framework



Source: Researcher's Construct

Literature Review

Historical and Legal Roots of Statelessness. The 1982 Myanmar Citizenship Law remains the legal foundation of the Rohingya's statelessness. Leider (2018) traces its historical evolution, showing how citizenship revocation institutionalized exclusion, while Ullah (2016) highlights its human costs: trafficking, exploitation, and chronic insecurity. Ahmed (2019) connects these dynamics to Bangladesh's security environment. Together, these studies reveal that statelessness is not merely a legal anomaly but a structural driver of humanitarian and security crises.

Humanitarian and Security Dimensions of Displacement. Farzana (2020) and Baruah (2018) identify how porous borders and weak enforcement foster transnational crimes like human and narcotics trafficking. Chowdhury (2023) situates this within Bangladesh's strategic dilemma, balancing humanitarian compassion with geopolitical realities involving India, China, and ASEAN. Ullah (2016) and Farzana (2020), however, stress that the crisis must also be viewed through a human security lens, as prolonged displacement amplifies personal vulnerability and community-level tension.

Regional Diplomacy and Governance Failures. Kipgen (2020) and Cheesman (2017) critique ASEAN and SAARC for diplomatic inertia, and Myanmar's military control hinders regional coordination. The International Crisis Group (2019) reinforces this view, linking governance failure to the proliferation of illicit networks. Elahi and Hossain (2021) add that international responses have remained largely rhetorical, calling for enforceable accountability and equitable burden-sharing. Collectively, these analyses expose both political paralysis and moral deficit in regional refugee governance.

Radicalization and Social Tensions in Refugee Settlements. Alam and Karim (2021) and Bashar (2022) warn that prolonged exclusion and

religious manipulation heighten risks of militant recruitment. At the same time, Shohel (2023) and Khan et al. (2024) identify that narcotics and gang networks drive rising criminalization within camps. These studies converge on the notion that deprivation and exclusion foster a "security vacuum," though they differ in emphasis. Some highlight ideological motives and others point to structural and economic triggers. The gap between these perspectives underscores the need to connect radicalization and organized crime.

Media and Investigative Reports. Contemporary reports by the International Crisis Group (2019), Press Xpress (2021), and AP (2025) document escalating violence and the erosion of governance within camps. The Times (2025), Time Magazine (2023), and The Wall Street Journal (2024) portray the humanitarian collapse, youth fleeing via smugglers, women exploited in labor networks, and children facing stateless futures. These journalistic accounts substantiate academic findings, offering current evidence of the nexus among deprivation, insecurity, and organized crime.

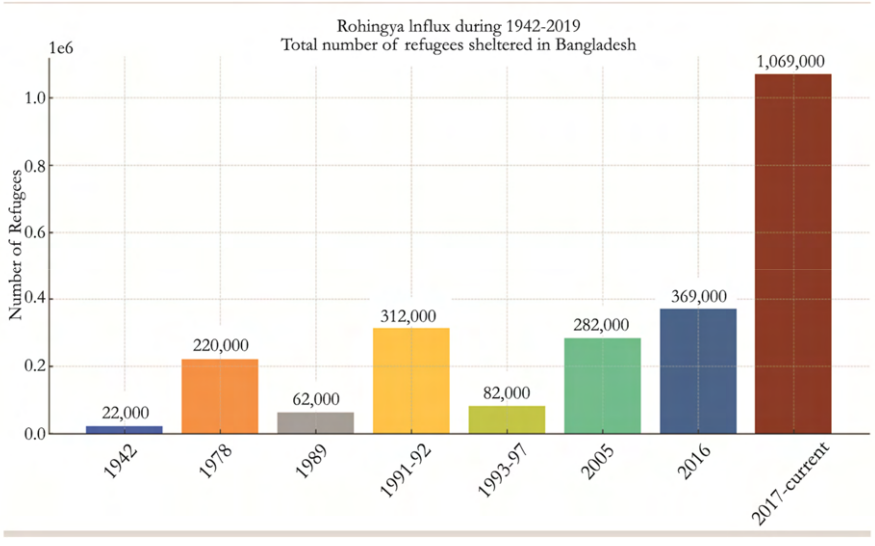
Research Gap and Scope for Current Research. The existing literature reveals strong linkages between statelessness, displacement, and transnational insecurity but remains fragmented across humanitarian, legal, and security disciplines. The absence of integrated empirical frameworks linking socio-economic deprivation to organized criminality and radicalization underscores the necessity of the present study's multidimensional approach.

Background of the Rohingya Crisis and Bangladesh's Effort to Manage the Crisis

Historical Context and Root Causes of the Rohingya Crisis. The Rohingya crisis has deep historical roots in Myanmar, previously known as Burma. The Rohingyas assert their long-standing presence as a Muslim ethnic minority in Rakhine State. However, their identity

has been a subject of contention with the government and the majority Buddhist population. They endured decades of systematic discrimination and violence in Myanmar, which culminated in the 2017 military crackdown. Details of the influx of Rohingya to Bangladesh are shown in Figure 2.

Figure 2: Influx of FDMN to Bangladesh (UNDP)



Source: Researcher's Construct

Socio-economic Aspects of Displacement and Statelessness. As stateless individuals, FDMN are denied citizenship by Myanmar and lack formal refugee status in Bangladesh, which sustains cycles of poverty, dependency, and social exclusion. The scarcity of formal employment opportunities has resulted in widespread economic hardship. According to the International Organization for Migration (IOM-2022), approximately 74% of working-age FDMN men in the camps are either unemployed or engaged in irregular and informal labor.

Bangladesh's Effort in Addressing the Crisis

Bangladesh's primary approach to the FDMN crisis has focused on humanitarian assistance and on containing the refugee population within designated camps in the Cox's Bazar region. Over 920,000 people reside across 30+ camps, with comparatively weak surveillance. Surveillance is weak, and security is porous due to the terrain and high population density. FDMN refugees are within about 13 km² in Ukhia, yielding a staggering 52,800 people/ km² as of the end of 2024. A camp-wise FDMN is shown in Table 1.

Table 1: FDMN in Various Camps (RRRC 2025)

Ser	Name of Camp	Upazilla	Total Manpower
1.	Ukhiya Camp (Camp 1 to 20 and 20 Extension)	Ukhiya	786167
2.	Teknaf Camp (Camp 21 to 27)	Teknaf	136981
3.	Kutupalong Registered Camp	Ukhiya	18197
4.	Nayapara Registered Camp	Teknaf	24811
5.	Bhasan Char	-	35059
Total			**1,03,215.00**

Source: Researcher's Construct

The reduction in aid services from 2023 weakened the humanitarian safety net and also contributed to increased crime and despair within the camps, particularly among youth with limited prospects. The fund allocation for the FDMN from 2017 to 2025 is shown in Table 2.

Table 2: The Fund Allocation for FDMN(WFP, UNHCR)

Ser	Year	Joint Response Appeal (USD)	Funding Coverage	WFP Food Aid/Month (USD)	Key Issues
1.	2017	875 million	40–50%	12.50	Full rations, services
2.	2018–19	650–700 million	50%	12.50	Start of donor fatigue

Ser	Year	Joint Response Appeal (USD)	Funding Coverage	WFP Food Aid/Month (USD)	Key Issues
3.	2020–22	850–950 million	40%	10 → 8	Ration cuts, reduced programs
4.	2023	876 million	31%	8	Peak food insecurity
5.	2024–25	934 million (2025)	15% (as of mid-2025)	12 restored (US Aid)	Partial recovery, but still fragile
Source: Researcher's Construct					

Bangladesh Government has taken measures to relocate a segment of the refugee population to Bhasan Char due to the lack of improvement in the political situation in Myanmar. It is a remote island facility built to decongest the overburdened camps in Cox's Bazar. Bangladesh has not signed the 1951 Refugee Convention. Thus, the current legal arrangements do not grant refugee status to the FDMN, instead treating them as "Forcibly Displaced Myanmar Nationals" (FDMN). This limits their rights under international refugee law.

Bangladesh's Policies and Law Enforcement Efforts. Since the FDMN influx in 2017, the Bangladesh government has coordinated various efforts through the Refugee Relief and Repatriation Commissioner (RRRC) and deployed security forces, such as the Armed Police Battalion (APBN), in the camps. Law enforcement has struggled with issues such as insufficient staffing, unclear jurisdictional boundaries, and logistical challenges. The lack of a strong legal structure specifically addressing crimes related to refugees further complicates matters (Elahi & Hossain, 2021)

Governance Gap and Law Enforcement Challenges. The administration of the camps is significantly overextended. A 2021 report by the Bangladesh Ministry of Home Affairs indicated that the police-to-population ratio in FDMN camps is approximately 1:2,200, four times

the national average of 1:550. Security checkpoints are infrequent, access is restricted for law enforcement agencies, and intelligence gathering is limited by language barriers, a lack of trust, and the presence of armed factions.

Lack of Legal Status and Protection Mechanisms. Statelessness deprives individuals of rights and protections typically guaranteed by nationality. FDMN children face a long-term risk of permanent statelessness due to a lack of birth registration and legal documentation. Furthermore, without recognized refugee status, FDMN residents lack access to institutional remedies, employment protections, and justice mechanisms, as Bangladesh has not signed the 1951 Refugee Convention.

Impact of the Protracted Stay of the FDMN in Bangladesh

Socio-economic Impact on Host Communities

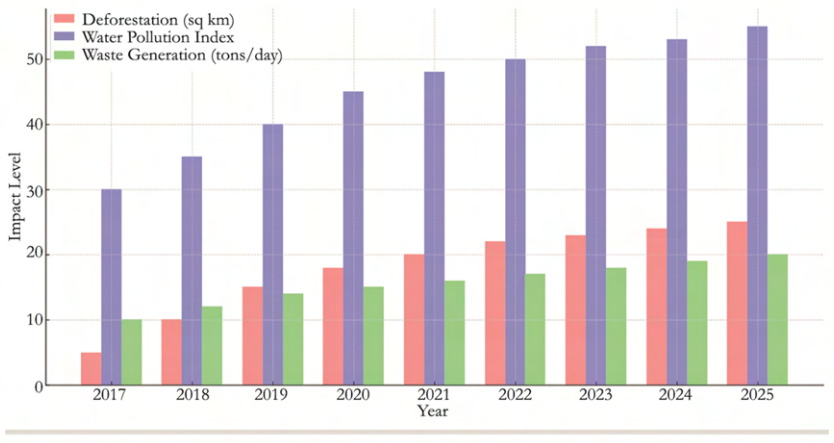
Depressed Wages and Labor Market Displacement. The FDMN refugees have significantly disrupted the local labor market by willingly working for lower wages. Specifically, Ukhiya and Teknaf experienced a 25–30% wage decrease for agricultural and construction workers within just one year following the influx (ILO, 2020). Thus, many locals have been displaced from their daily wage jobs, as employers opt for FDMN workers who accept lower pay.

Inflation and Market Disruptions. The influx of refugees and humanitarian actors has triggered inflation and market disruptions in the local economy. Prices of basic goods have risen by 20–40% since the 2017 influx (UNDP, 2018). In addition, rental accommodation has become unaffordable for many locals, as house rental prices near the camps have more than doubled in Ukhiya and Teknaf (IOM, 2019).

Environmental Degradation and Resource Stress. According to reports from the Bangladesh Forest Department, over 6,000 acres of

forest land have been cleared to accommodate camps, primarily in the Teknaf Wildlife Sanctuary and the Inani Reserve Forest. The environmental impact of the FDMN's prolonged stay is illustrated in Figure 3. This deforestation has increased soil erosion, exacerbated flash floods, and reduced biodiversity, thereby affecting ecosystem services.

Figure 3: Environmental Effects of FDMN Influx in Bangladesh 2017-2025



Source: Researcher's Construct

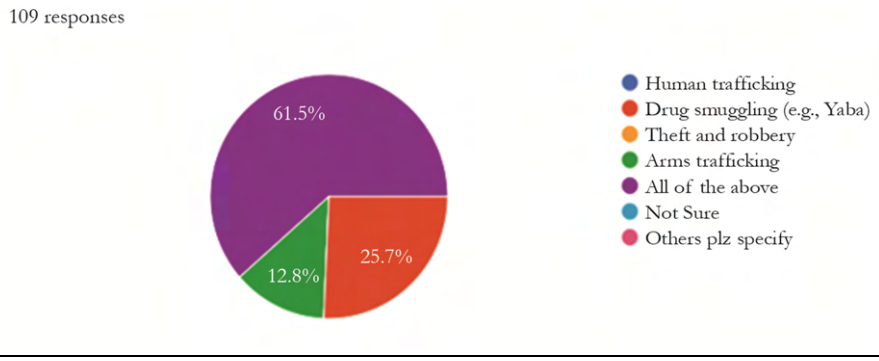
Rising Crime and Criminal Networks

Bangladesh Police and the Department of Narcotics Control (DNC) report that over 2,500 FDMN individuals were arrested for Yaba (methamphetamine) trafficking between 2017 and 2024, with Teknaf being a key transit point for drugs from Myanmar. Law enforcement has confiscated over 45 million Yaba tablets in Cox's Bazar since the crisis began, many trafficked via FDMN intermediaries (DNC Annual Report).

Between 2017 and 2023, at least 75 killings occurred in and around the camps, including conflicts between groups like Arakan Rohingya Salvation Army (ARSA) and Rohingya Solidarity Organization (RSO). According to the survey results, more than 61% of respondents opined

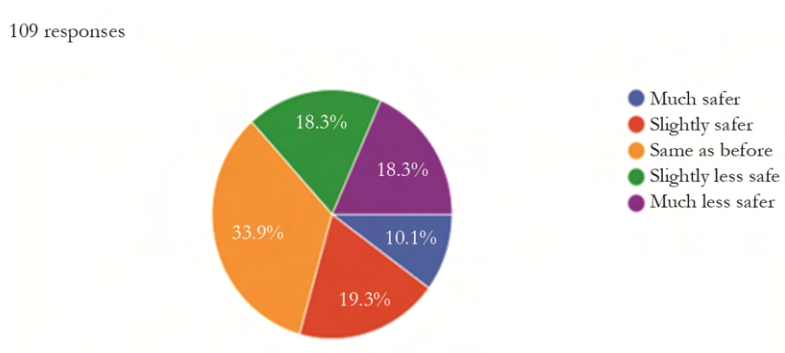
that all kinds of criminal activities have increased, including arms and drug trafficking, as shown in Figure 4. The safety index of the locality after the arrival of the FDMN, as per the survey, is given in Figure 5.

Figure 4: Rise of Criminal Activities after the FDMN Influx in Bangladesh



Source: Researcher's Construct

Figure 5: The Safety Index of the Locality after the Arrival of FDMN in 2017



Source: Researcher's Construct

Radicalization and Extremism Risks. The lack of formal schooling, vocational training, and civic engagement opportunities for FDMN youth, particularly those aged 15–30, poses long-term risks of ideological or militant indoctrination. Despite these vulnerabilities, so far there are

no reports of FDMN involvement in extremist or religiously motivated armed groups (ISCG, 2025). However, the International Crisis Group (ICG) has warned that disillusionment among displaced FDMN could lead to alignment with militant narratives as a means of resistance or survival.

Future Risks of Prolonged Statelessness

Generational Entrapment and Loss of Human Capital. More than half (52%) of the FDMN in Bangladesh are under 18 (UNHCR, 2024). Many have never had a formal education because the Myanmar curriculum pilot program is limited and lacks certification (UNICEF, 2023; ISCG, 2024). According to a World Bank report from 2022, youth unemployment among FDMN's aged 18–30 is over 70%, resulting in widespread frustration, mental health issues, and social isolation. An age- and gender-based breakdown, including a summary of the 18-30-year-old population, is provided in Tables 3 and 4, respectively.

Table 3: Age and Gender Based Breakdown (approximate) (Wikipedia)

Age Group	% of Total	Gender Balance	Notes
Under 18	52%	Balanced or slightly more male	Child sex ratio - 100M: 95F
18–59 (Adults)	44%	55% female (24.3% F versus 19.6% M)	Female-heavy in working-age population
60+ (Elderly)	4%	Small share; gender specifics not detailed	-

Source: Researcher's Construct

Table 4: Summary of 18-30 Years Age-Based Population (Source: Wikipedia)	
Statistics	**Estimate for Ages 18–30**
Total individuals	260,000–280,000
Gender balance	55% female and 45% male
Out-of-school/unemployed	69% overall (Out of males: 41% and females: 93%)
Source: Researcher's Construct	

Radicalization and Militancy Risks. Intelligence and the International Crisis Group (ICG), 2022, have expressed concern that regional or transnational extremist groups could recruit marginalized FDMN youth. A lack of hope for return, visible injustice, and exploitation in illicit networks may create conditions similar to other protracted refugee crises, such as those among Palestinians or Afghan refugees. Although no major radical movement has emerged from FDMN in Bangladesh, the potential for extremist spillover exists and may worsen if the international community continues to delay a durable solution. The estimated number of FDMN Joining Armed Groups from 2017 to 2025 is shown in Table 5.

Table 5: Estimated FDMN Joining Armed Groups (2017–2025) (ICG and Washington Post)		
Year	**Estimated FDMN Joined Armed Groups/Militias**	**Key Developments and Notes**
2017–2020	Very limited documented recruitment of ARSA	No systematic recruitment figures publicly available
2021–2022	ARSA - Hundreds (estimates)	Post-Muhibullah killing (2021). Dhaka crackdown led to estimated recruitment continuing clandestinely
Early 2024	3,000–5,000 (in first half of 2024 alone)	Forcible conscription into ARSA, RSO, etc. across Cox's Bazar camps
Source: Researcher's Construct		

Transnational Crimes and Vulnerabilities

Role of Organized Criminal Networks

Organized criminal networks have swiftly exploited the vulnerabilities created by statelessness, poverty, and governance gaps. The FDMN refugee camps have become hubs for transnational criminal activities, including drug trafficking, arms smuggling, and human trafficking. The cases filed against FDMN on various crimes are listed in Table 6. From 2017 to 2023, law enforcement agencies in Bangladesh recorded over 4,500cases involving FDMN individuals in such crimes (Dhaka Tribune, 2023).

Intelligence reports and statements from the Department of Narcotics Control suggest that the Arakan FDMN Salvation Army (ARSA) and other non-state actors are supporting cross-border trafficking. Armed Groups involved in transnational crimes in the FDMN camps and the Teknaf area are given in Table 7. The porous 271 km border, including maritime routes and the Naf River, facilitates the movement of illicit goods.

Table 6: Filed Cases of Criminal Activities against FDMN (2017-2023)

Type of Case	2017		2018		2019		2020		2021		2022		2023	
	No of Case	No of Defendants	No of Case	No of Defendants	No of Case	No of Defendants	No of Case	No of Defendants	No of Case	No of Defendants	No of Case	No of Defendants	No of Case	No of Defendants
No of weapons cases	12	23	13	21	17	46	27	80	43	101	75	185	108	225
Number of drug cases	22	40	95	159	152	248	256	445	429	444	871	1317	408	556
No of rape or attempted rape cases	2	2	16	27	15	29	11	19	23	27	25	38	11	13
No of kidnapping cases	0	0	9	39	6	40	4	19	11	63	10	49	8	29
Robbery and robbery preparation cases	2	6	7	26	0	0	1	14	15	138	35	314	0	0
No of murder cases	2	2	25	25	18	18	20	20	31	37	37	41	76	359
No of other cases	4	16	61	61	13	34	18	101	55	221	59	335	59	288
Human trafficking cases	0	0	2	8	23	106	3	23	0	0	6	38	4	24
State of Total:	70	139	249	406	259	560	349	752	624	1125	1139	2368	683	1506

Source: Researcher's Construct

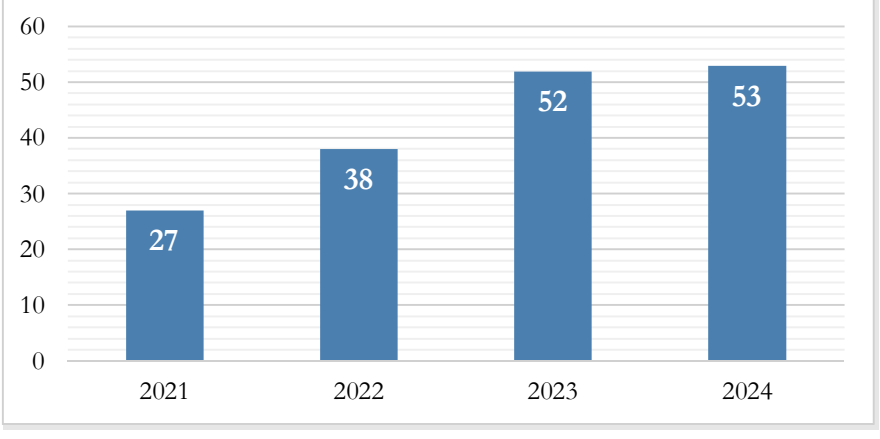
Table 7: Armed Groups involved in Transnational Crimes in the FDMN Camps and the Teknaf Area

Ser	Armed Group	Activities
1.	Arakan FDMN Salvation Army (ARSA)	Insurgent against Myanmar forces; now linked to drug smuggling, kidnapping, and targeted violence within camp and border regions
2.	FDMN Solidarity Organization (RSO)	Formed in the 1990s and reactivated in the post-2017 influx. Rival to ARSA
3.	Islamic Mahaz, Master Munna and Nobi Hossain Armed Group	Active rival networks engaged in robbery, turf wars, local arms and drug trade.
4.	Robbery rings: "Chakma robber group", "Putia Robber Group", "Salman Shah Group", "Zakir Group", and "Jabu Group"	Smaller but active rival networks engaged in robbery and drug trafficking.

Source: Researcher's Construct

Additionally, criminal syndicates have established informal networks within the camps, using intimidation, extortion, and bribery to maintain control. The involvement of FDMN in various murder cases is shown in Figure 6.

Figure 6: List of Murder Cases by Rohingya Population from 2021-2024



Source: Researcher's Construct

Human Trafficking and Smuggling Networks. Human trafficking has become a widespread and severe crime due to the FDMN crisis. The lack of legal recognition, restricted access to education and jobs, and inadequate living conditions in the camps have made many FDMN, especially women and children, highly susceptible to exploitation. Such individuals often endure forced labor, sexual exploitation, or modern slavery. Human trafficking of FDMN showed a steady increase from 2020 to 2024, as shown in Table 8.

Table 8: Human Trafficking Data of FDMN from 2020-2024

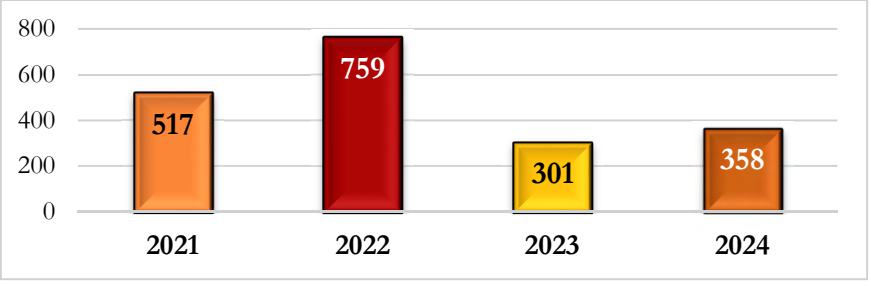
Year	Human Trafficking Cases	Remarks	Reference
2020	Approximately 500	Identified or rescued from trafficking and smuggling networks in Bangladesh and Malaysia.	UNHCR (2020) IOM (2020)
2021	Around 620	Surge linked to pandemic-related unemployment and movement restrictions.	US Department of State (2021)
2022	67	FDMN smuggled from Aceh to Malaysia; dozens of trafficking arrests recorded in Cox's Bazar	IOM (2022) ISCG (2022)
2023	138	Increase in camp-based recruitment and forced marriage cases observed	IOM (2023)
2024	5,300	Ransom-based trafficking and extortion. Several major maritime tragedies reported	UNHCR (2024) Reuters (2024)

Source: Researcher's Construct

Drug Trade and Arms Trafficking

Cox's Bazar has become a significant transit point for narcotics, especially yaba, being located near the Rakhine and Chin States of Myanmar, which are known for drug and arms production. According to intelligence reports, drug syndicates take advantage of the disorder in the camps to recruit couriers and develop supply networks. FDMN youth are often enticed into trafficking in return for small payments. The drug recovery cases against FDMN are shown in Figure 7.

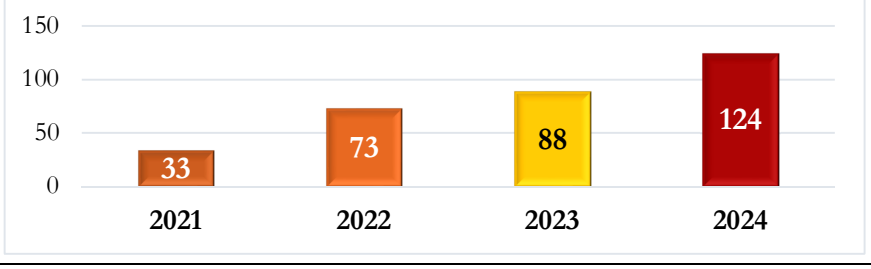
Figure 7: Cases of Drug Trafficking by FDMN from 2021- 2024



Source: Researcher's Construct

Although less publicized, arms smuggling is still a concern. Weapons smuggled across unsecured borders are sometimes found during law enforcement raids, indicating a dangerous increase in criminal activity in the region. The involvement of FDMN in arms trafficking is shown in Figure 8.

Figure 8: Cases of Arms Recovery from FDMN Armed Groups from 2021-2014



Source: Researcher's Construct

Current Arrangements at the Regional and International Level in Addressing the Crisis

Bangladesh's Diplomatic Engagements on the FDMN Crisis

Multilateral Engagement and Limitations. Bangladesh's diplomacy has been largely humanitarian in tone, yet it now requires a strategic recalibration (KI-2. Although organizations such as the Organisation of Islamic Cooperation (OIC), Association of South East Asian Nations (ASEAN), and South Asian Association for Regional Cooperation (SAARC) have recognized the crisis, they have not offered a united or enforceable solution. ASEAN's policy of non-intervention and internal disagreements have hampered regional consensus. Bangladesh has received token support from countries such as the USA, Canada, the United Kingdom, and the European Union, but tangible assistance and resettlement pledges have been limited.

Engagement with Myanmar and Repatriation Process. The Arakan Army's (AA) success in capturing 90% of Rakhine has added a new dimension to the FDMN crisis. Bangladesh has consistently called on major global powers, including China, the United States, and the European Union, to use diplomatic pressure. International follow-through has been hindered by geopolitical complexities, donor fatigue, and a shifting global focus, which has been intensified by other crises such as the war in Ukraine and the conflicts in Gaza (Ministry of Foreign Affairs, 2022).

Role of the International Community in Preventing Transnational Crimes. United Nations Office on Drugs and Crime (UNODC) reports indicate that trafficking networks, drug cartels (particularly Yaba smugglers), and arms dealers are taking advantage of the volatile conditions in the FDMN camps (UNODC, 2021). Organizations like Interpol, United Nations High Commission for Refugees (UNHCR), and International Organization for Migration (IOM) have suggested enhancing biometric tracking, AI-based monitoring, data fusion, cross-border intelligence coordination, and increasing policing resources. Limited and informal intelligence exchanges between Bangladesh, India, and Myanmar exist, but they remain episodic and personality-driven (KI-5).

Role of Regional and International Organizations. SAARC's absence on the issue and Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) weak operational capacity were also identified as gaps hindering regional coordination. ASEAN, as the most relevant regional body given Myanmar's membership, has struggled with internal divisions that hinder a united approach. Globally, the international community is increasingly viewing the FDMN crisis not just as a humanitarian issue but also as a global security concern. Organizations such as the UNDOC, IOM, and The International Criminal Police Organization (INTERPOL) have noted the increasing risks of criminal activities linked to refugees.

Effectiveness of Repatriation and Resettlement Initiatives. Bangladesh signed two repatriation deals with Myanmar in 2017. Repatriation remains halted owing to concerns regarding security and citizenship in Myanmar. Repatriation is still a long way off unless conducive conditions can be established in Rakhine. It needs a three- to four-year short-term strategy for holding on to the FDMN constructively and establishing appropriate living conditions, with international cooperation, such as the Marshall Plan, in Western Europe after the Second World War. A long-term plan may extend up to six years for a massive repatriation of the FDMN.

Comparative Insights from Other Refugee Crises. Examining past instances of long-term displacement reveals several patterns. The unresolved situation of Palestinian refugees in Lebanon has fostered armed groups and political instability. Jordan's experience with Syrian refugees shows how extended hosting can deplete resources and weaken social unity. Likewise, Kenya's Dadaab refugee camps for Somalis have become grounds for dissatisfaction and, in some cases, radicalization (Loescher& Milner, 2005). The study highlights that failing to resolve refugee crises through repatriation or genuine inclusion can result in lasting insecurity.

Strengthening Future Strategies and Policy Options for Sustainable Solutions to the FDMN Crisis

Strategic Initiatives and Coordinated Response. Addressing the complex challenges of the FDMN crisis requires a comprehensive and collaborative approach. Key strategic areas include:

Revitalizing Regional Diplomacy. Bangladesh should seek to reframe the FDMN crisis as a matter of shared global responsibility. SAARC and BIMSTEC should broaden their mandates to encompass refugee-related security cooperation. They should form a dedicated task force to address transnational threats associated with displacement. Bangladesh should call for International Court of Justice (ICJ)/International Criminal Court (ICC) proceedings against Myanmar and use regional diplomatic leverage with China and India to pressure Myanmar into safe repatriation.

Strengthening Intelligence and Border Security. Bangladesh and neighboring countries (India and Myanmar) must establish formal systems for joint surveillance, border patrols, and timely intelligence sharing, particularly in sensitive areas such as Teknaf and the Naf River. Establish camp-based intelligence cells and appoint multilingual community mediators to aid intelligence gathering. Engage religious leaders in counter-extremism discourse and initiate de-radicalization efforts through vocational education, peer-led mentoring, and campaigns.

Leveraging Global Forums and Conditional Aid. Bangladesh and its well-wishers should use international platforms such as the UN General Assembly and Security Council to advocate for binding commitments to repatriation. The creation of suitable infrastructure for economic activities and educational facilities in Rakhine remains a prerequisite for FDMN repatriation. It should be carried out as part of the Rakhine reintegration and recovery plan, in coordination with all stakeholders.

Expanding Third Country Resettlement Options. Bangladesh should collaborate with UNHCR and willing host countries to enable the safe and voluntary resettlement of vulnerable FDMN. It should be supported by multilateral funding through mechanisms like the Global Compact on Refugees and IOM.

Short-Term Strategy for Constructive Engagement, Crime Prevention, and Developing Pathways for Repatriation (2025–2028). Bangladesh should consider a strategy that balances containment with respect for human dignity. This involves maintaining the FDMN through active engagement, facilitating gradual migration to third countries, and preparing for eventual repatriation.

Community Stabilization and Crime Prevention. Initiate vocational training and small business programs for young people and women in the camps, focusing on areas such as tailoring, renewable energy, ICT-based livelihoods, handicrafts, and sustainable agriculture. These programs can be led by UNHCR, IOM, BRAC, and RRRC in close coordination with APBN and UNODC to enhance security.

Skilled Migration Pathways. Bangladesh should pursue an international agreement, in close collaboration with the UN, to accept trained FDMN individuals as temporary workers (1,000–2,000 annually) from OIC countries, Canada, Germany, Australia, the European Union (EU), and the Gulf States. This effort would likely be manageable by IOM, the Ministry of Foreign Affairs of Bangladesh, and the host country missions.

Creating Conditions for Repatriation in Arakan. Encourage dialogue between the Myanmar Government, the Arakan Army (AA), and international bodies to establish independent local governance and infrastructure in Rakhine to facilitate the repatriation. It is worth mentioning that Rakhine (Arakan) is unstable and underdeveloped. Thus, a coordinated regional development framework is urgently needed for investment in education, security, livelihoods, and infrastructure.

Bangladesh should focus on these efforts with the UN Special Envoy to Myanmar and maintain lateral communication with the USA, UN, EU, China, India, and ASEAN to keep Myanmar under pressure to accept such a venture.

Unfold Pragmatic Dual Track Negotiation with Myanmar and AA. The AA, being a non-state actor, can play a pivotal role in repatriating the FDMN. It holds increasing de facto control over more than 80% of the 271 km of the border with Bangladesh (The Daily Star, 2025). Bangladesh must pursue a pragmatic dual-track approach to negotiations with both the Myanmar Government and the emerging AA regarding FDMN repatriation. Bangladesh can facilitate humanitarian logistics and, with donor support, propose tripartite development projects in Rakhine.

Long-Term Strategy for Repatriation with International Oversight (2026–2032). The ultimate goal is a voluntary, safe, and respectful repatriation process, monitored globally as follows:

- **Leveraging the Burma Act for Repatriation of FDMN**. The US Burma Act -2022 aims to support democracy, human rights, humanitarian assistance, and funding for refugees and displaced persons**,** including Rohingya in Myanmar **(**US National Defense Authorization Act -2022). Bangladesh should leverage its ties with the USA, keep the Burma Act at the forefront, and pressure Myanmar to restore citizenship rights and facilitate the reintegration of FDMN into Rakhine.

- **Geopolitical Alignment with the Friendly Countries of Myanmar**. Bangladesh should use its diplomatic goodwill with Russia and Pakistan to exert influence on Myanmar, as they are apparently maintaining a good diplomatic relationship and an exchange program for military hardware. China and ASEAN countries cannot remain at peace if Rakhine is unstable. Thus, Bangladesh should enhance its diplomatic endeavors with China

and ASEAN countries, highlighting the geostrategic importance of Rakhine, to take the lead in maintaining peace and facilitating post-repatriation reconstruction efforts of FDMN in Rakhine.

- **Proposed Phased Repatriation of Rakhine to Myanmar**. Having initiated and implemented the Short-Term repatriation strategy, Bangladesh should pursue a pilot program to return 5,000–10,000 FDMN individuals per year starting in 2027. Gradually, under the joint supervision of UNHCR, Bangladesh, Myanmar, and AA, increase it to 30,000 annually by 2030. A timeline for complete repatriation of FDMN is shown below :
    - **2026:** Achieve diplomatic consensus, form task forces, and begin camp-based vocational training programs for youths.
    - **2027–2028:** Initiate skilled migration to developed countries and begin the pilot repatriation program.
    - **2029–2032:** Scale up voluntary repatriation, with a total of 100,000–150,000 returnees by 2032.

Conclusion

The FDMN crisis remains the most complex humanitarian and security challenge confronting Bangladesh and the region. Originating from Myanmar's systemic persecution and the denial of citizenship, the crisis has evolved from a humanitarian emergency into a multidimensional concern encompassing socio-economic, legal, security, and geopolitical dimensions. This study validated the hypothesis that prolonged displacement, statelessness, and socio-economic deprivation create conditions conducive to organized crime and regional instability. The analysis revealed that the absence of legal status, combined with deprivation and marginalization, has fostered vulnerabilities to transnational crimes, radicalization, and social unrest.

Bangladesh's humanitarian generosity has reached its structural limits, at the cost of environmental degradation, strained public services, and local resentment, emphasizing the urgency of a durable solution. Governance and legal protection gaps, along with waning international attention, further exacerbate the crisis. Sustainable resolution demands a multi-pronged strategy in a set timeframe combining domestic legal reform, enhanced security governance, and regional cooperation to ensure accountability, protection, and eventual repatriation.

Bangladesh must lead diplomatically to forge a collective regional framework under ASEAN-BIMSTEC and mobilize global actors, including the UN, OIC, EU, and major powers, to press Myanmar for safe repatriation and reconstruction in Rakhine. Ultimately, the crisis is not only a test of Bangladesh's resilience but also of global moral responsibility. Transforming despair into stability will require a shift from reactive humanitarianism to proactive diplomacy, rooted in the safe repatriation of FDMNs with legal rights to Myanmar, for greater peace in the region and beyond.

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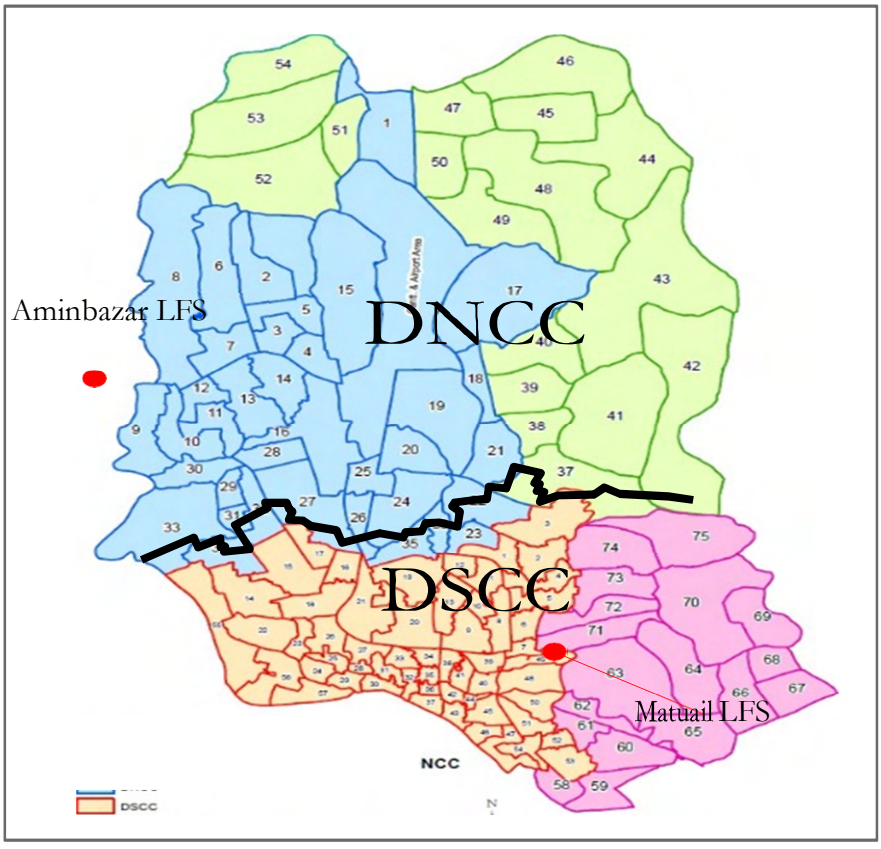
WASTE TO ENERGY AS AN INNOVATIVE WASTE MANAGEMENT SOLUTION: CHALLENGES AND OPPORTUNITIES FOR DHAKA NORTH CITY CORPORATION

Commodore S M Sharif Ul Islam, (N), NPP, PCGM, PCGMS, ndc, psc, BN

Introduction

Bangladesh's capital, Dhaka, has witnessed rapid urbanization and administrative changes. The previous Dhaka City Corporation was split into two city corporations, namely Dhaka North City Corporation (DNCC) and Dhaka South City Corporation (DSCC), in 2011 to decentralize governance and improve municipal service delivery (Parvin, 2013). The area of DNCC is 373 km², and it has one of the highest densities in the world (around 24,365 persons per km²), if about one million temporary dwellers of Dhaka are also included in the count (BBS, 2022; DNCC, 2023). The situation is further complicated by the high floating population, resulting in daily waste generation of nearly 4,000 tonnes in DNCC (DNCC & JICA, 2019). The geography of the city only amplifies the issue: rivers surrounding DNCC are not only filled with untreated waste and leachate but, especially during monsoon floods, rising waters wash waste from these heaps into the waterways (Islam et al., 2021; Rahman et al., 2019). Such combined pressures make the case for zero-waste and ecological practices all the more compelling.

Map 1: Areas of DNCC and DSCC



Source: JICA Project Team

Over the past two decades, DNCC has made many improvements to the range of waste services available. A variable number of door-to-door collections, mechanized trucks, and private services, along with Secondary Transfer Stations (STS), have pushed coverage up to about 90%, up from 42% in 2003 (Mostakim et al., 2021; DNCC & JICA, 2019). However, around 500 tons go uncollected every day, piling up in streets, gutters, and rivers.

Aminbazar landfill occupied 50 acres and was saturated by 2019; the DNCC had to purchase an additional 52 acres of land (DNCC & JICA,

2019). Although the landfill operates at a quasi-sanitary level, no protective measures are in place (such as liners, caps, or gas vents). Effects of leachate pollution from the landfill site on rivers during the monsoon season, and methane generation, contribute to climate change, with emissions of up to 4 tons/hour of methane (Mondal & Kitawaki, 2023). This is all the fault of a reliance on landfill. Even with better collection, DNCC's disposal system is linear, i.e., every bit of waste goes to landfills with no resource recovery. Long-term dumping has polluted the environment and affected the local population (Muthuraman et al., 2019). The authorities are currently attempting to build a 30-acre Waste-to-Energy (WtE) incineration plant at Aminbazar, which will be able to burn 3,000T/day and produce 42.5 MW of power (Munjer et al., 2023). This work serves as a building block for the circular economy, which reduces reliance on landfills, recycles resources, and contributes to renewable energy goals (Mostakim et al., 2021). Here is the map of Aminbazar Landfill:

Map 2: Areal Map of Aminbazar Landfill Site



Source: JICA Project Team

Aim

To holistically examine W2E as an alternative waste management technology for DNCC and to outline the obstacles, opportunities, and ground-level actions critical to its future success.

Objectives

- To evaluate the existing waste management system of DNCC by identifying present practices, inefficiencies, and gaps, and determining the environmental and health risks of WtE implementation.
- To identify the main barriers to WtE implementation in DNCC, including technical, governance, economic, legislative, environmental, and socio-cultural barriers.
- To analyze the benefits of DNCC's 42.5 MW waste incineration plant in terms of its significance for waste management, green energy generation, public health, environmental sustainability, and the availability of future scaling opportunities by situating the DNCC waste incineration plant within the framework of circular economy principles.
- To advise on policy directions for efficient project implementation and to realize the full potential of the WtE plant.

Significance of the Research

The study is also of timely and national relevance. The increasing amount of waste in Dhaka and the inefficient waste disposal process reflects the urgency for contemporary solutions that go beyond landfills (Kaza et al., 2018). The study provides a critical analysis of the proposed DNCC's WtE plant, covering institutional preparedness, technical feasibility, environmental protection measures, financing, and public

acceptability. As one of the first large-scale WtE projects in Bangladesh, the results can serve as an example for other city corporations such as Chattogram, Khulna, and Rajshahi. In the broader sense, the work aligns with several Sustainable Development Goals (SDGs): SDG 3 (Health), SDG 7 (Clean Energy), SDG 11 (Sustainable Cities), SDG 12 (Responsible Consumption), and SDG 13 (Climate Action).

Literature Review

This section reviews relevant literature to situate Dhaka's waste management context, examine international and national perspectives on WtE, and propose a conceptual framework for its integration into DNCC's system.

Under the Clean Dhaka Master Plan (CDMP) 2018–2032, landfill-based Municipal Solid Waste Management (MSWM) is characterized by several drawbacks: overuse of landfill sites, leachate leaking from landfills, malodor, and insufficient waste covering (JICA & DNCC, 2018). With a daily waste intake of nearly 4,000 tpd, the Aminbazar landfill is overfull and faces particular environmental and operational challenges. However, with certain institutional reforms and private-sector engagement, coverage is now approaching 80%. (Sohel et al., 2024).

However, system issues remain low coordination, suboptimal waste sorting, poor logistics organization, low valorization, and poor recovery routes (World Bank, 2021). To combat these problems, DNCC has signed a contract with a Chinese firm to construct a 3,000-ton/day WtE incinerator intended to produce 42.5 MW of electricity (Ahmed et al., 2023). While promising, technological divides, a lack of institutional capacity, a skills deficit, tariff issues, and public resistance are important challenges (Rahman & Kim, 2020; Kabir et al., 2021). Dealing with the remaining ash, which contains heavy metals and persistent toxins, could also lead to further environmental issues (Giusti, 2009; Zhang et al., 2010). Landfills remain important sources of methane, a greenhouse gas

with a global warming potential 28 times that of CO_2 (IPCC, 2014). Leachate pollution also endangers surface and groundwater (UNEP, 2019). Incineration reduces the volume of waste and provides energy, but discharge failures such as those demonstrated in Ethiopia's Reppie and India's Okhla plants have led to high levels of air pollution and community resistance (Abebe, 2018; Malav et al., 2020)

Globally, Extended Producer Responsibility (EPR) has been shown to shift waste management responsibilities back to producers, thereby promoting recycling and sustainable design initiatives (OECD, 2016). The EU and Poland demonstrate effective EPR models (European Environment Agency, 2021). Extended Producer Responsibility (EPR) is acknowledged in Bangladesh's Waste Management Rules 2021, though specific operational details are not provided here. Industrialized countries, including Germany, Sweden, and Japan, have made WtE an integral part of their waste systems by implementing stringent source separation, state-of-the-art emission regulations, and legal support (Arena, 2012; Brunner & Rechberger, 2015). Similarly, the urgency of managing the urbanization crisis and acute energy shortage has led to a preference for WtE in developing countries (Hoornweg & Bhada-Tata, 2012). Studies have revealed that trust, transparency, and stakeholder involvement are essential to preventing public resistance (Liu et al., 2018). For DNCC, it is all about encouraging dialogue, understanding, and community support so that people can get on board with the proposal.

The choice of technology must depend on the local waste composition, which in Dhaka is wet and organic-rich. It is more suitable for wet biodegradable waste and has already been successful in agricultural biogas projects across Bangladesh (Rahman et al., 2017). ATTs, e.g., gasification and pyrolysis, on the other hand, require homogeneously high-sorted, low-moisture waste and higher capital investment, making them less economically viable in the short term (Farooq et al., 2021; Leckner, 2020). WtE plants are typically funded through PPPs and revenues from the sale of electricity, as well as from charging for waste

disposal (World Bank, 2019; Huang, 2018). The literature highlights three main results. For one, the existing landfill-based model in Dhaka is environmentally unsustainable and will be unable to accommodate forecast waste volumes. Second, WtE provides a promising option; however, its success is contingent upon technology alignment. Finally, Global learnings provide useful do's and don'ts that can inform DNCC implementation.

Research Gap

Despite various studies that have examined the theoretical feasibility of WtE in Bangladesh and documented general challenges of the Solid Waste Management (SWM) system/situation in Dhaka, a significant research gap remains. This study attempts to offer a detailed, empirical evaluation of an individual, government-financed WtE project. Such an assessment is lacking, and this research provides a nuanced evidence base to guide policy and practice not only in Dhaka but also in other rapidly urbanizing cities with similar issues.

Methodology

Research Design

This research adopts a descriptive and exploratory case study design, using mixed methods to provide a deep understanding of the WtE implementation process in DNCC. The study draws on multiple data sources to inform a comprehensive, triangulated feasibility analysis of the intervention.

Data Sources

The research draws upon both primary and secondary data to ensure the validity and reliability of its findings. Primary Data were gathered through surveys using structured Likert-scale questionnaires to interview a representative sample of respondents about issues, attitudes, and practices. The sampling covered eight representative wards of the city; 291

city dwellers and 18 people living in proximity to the Aminbazar landfill were included, along with 20 sanitation workers and eight officials from the Waste Management Department (WMD) of DNCC. In-depth, semi-structured interviews were held with 10 key leaders. This included representatives from DNCC, the Bangladesh Power Development Board (BPDB), the Department of Environment (DoE), China Machinery Engineering Corporation (CMEC), and international development partners such as Japan International Co-operation Agency (JICA). Focused Group Discussions (FGDs) were conducted with residents of the community surrounding the landfill and with sanitation worker groups. This approach was employed to generate group wisdom from their everyday experiences, practical difficulties, and common concerns regarding both the existing landfill and the planned WtE facility. Secondary Data were gathered from a wide range of reputable sources. This included a thorough review of official government and municipal documents, such as the DNCC Clean Dhaka Master Plan 2018–2032, the Solid Waste Management Rules 2021, and the City Corporation Act 2009.

Theoretical Basis

Several theoretical perspectives informed the research. The Integrated Sustainable Waste Management (ISWM) approach was used as a model to discuss the transition from landfilling toward more diverse waste management options for minimization, reuse, and recovery. Circular economy theory re-conceptualized waste as a resource, rather than a burden. From this perspective, WtE could be situated within broader sustainability transitions. Energy transition theory situated WtE within Bangladesh's renewable energy aspirations, while EPR accentuated producers' responsibility for reducing the waste burden. The following table shows the connectivity between various theories and dependent and independent variables:

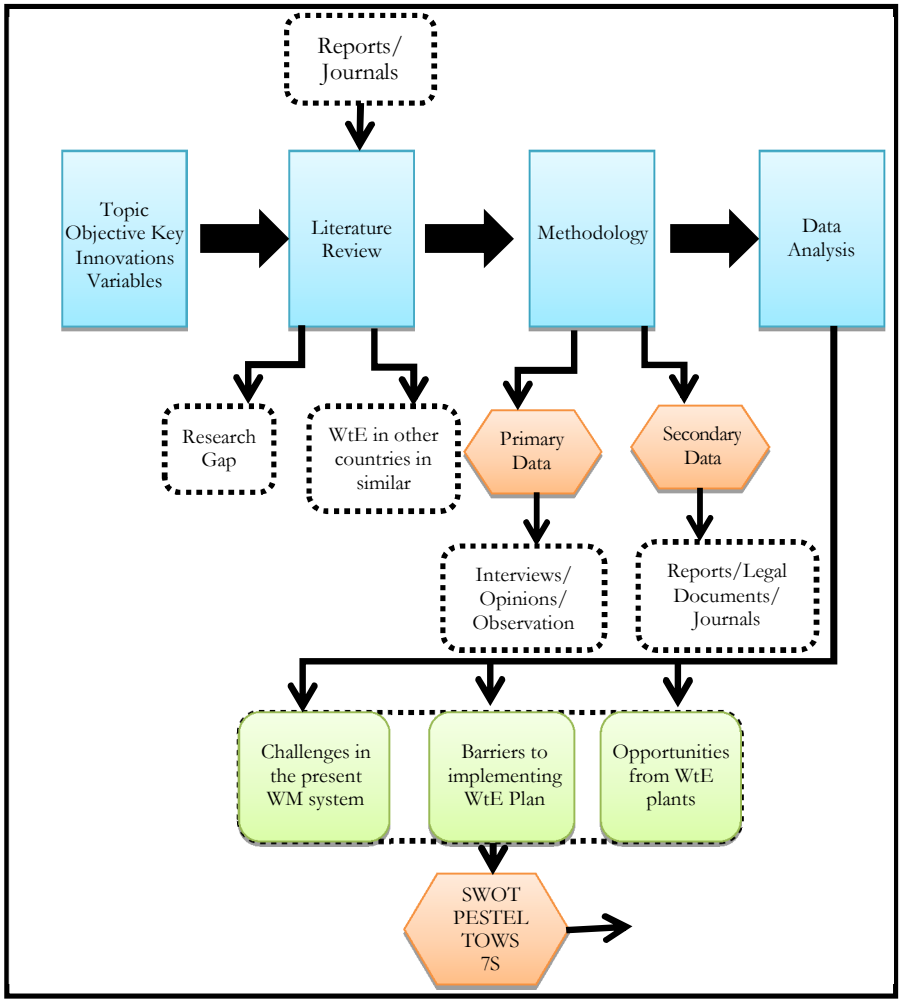
Table 1: Various Theories		
Theory	**Independent Variables**	**Dependent Variables**
Integrated Solid Waste Management Theory	Waste characteristics (composition, volume, moisture content)	Landfill dependency reduction, environmental improvement
Circular Economy Theory	Policy & regulatory frameworks, material recovery practices	Sustainability contribution, economic viability of WtE
Energy Transition Theory	Energy policies, financial models (PPP, green financing)	Energy diversification, climate impact mitigation
Extended Producer Responsibility Theory	Waste quality, producer accountability, policy incentives	Waste reduction, improved feedstock for WtE
Public Participation Theory	Citizen awareness, behavioral engagement, waste segregation	Public acceptance, operational success of WtE
Public-Private Partnership Model	Institutional capacity, financing mechanisms	Scalability, replicability, investment sustainability
Source: Researcher's Construct-2025		

Analytical Framework

Complementing this theoretical grounding, the research applied four strategic analytical tools to strengthen its evaluation Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis was applied to systematically determine the project's internal Strengths and Weaknesses and the external Opportunities and Threats in its operating environment. This was followed by a Threats, Opportunities, Weakness, Strength (TOWS) matrix to generate strategic options. The wider macro-environmental analysis was

then carried out using a Political Economic Social Technological Environmental Legal Factors (PESTEL) framework, which evaluates the Political, Economic, Social, Technological, Environmental, and Legal forces. The McKinsey 7S Framework was used to evaluate DNCC's internal organizational potential to manage such a project, focusing on its Strategy, Structure, Systems, Shared Values, Style, Staff, and Skills. A conceptual diagram has been made to address the research gap:

Figure 1: Conceptual Diagram



Source: Researcher's Construct (2025)

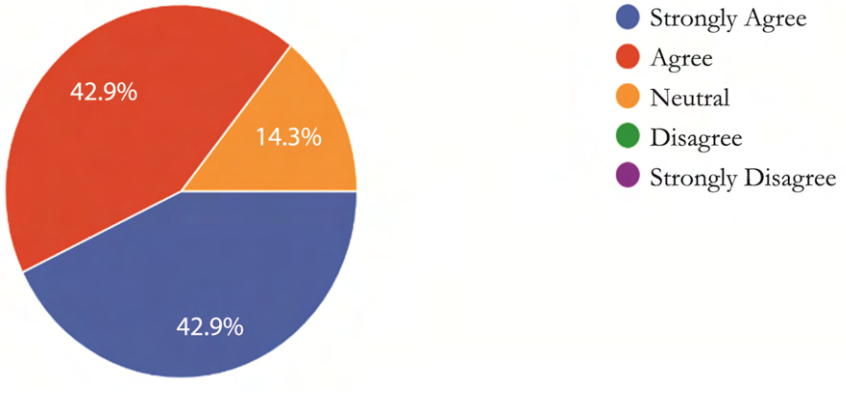
Findings

The results of this study highlight advances in DNCC for waste management and the systemic barriers that hinder its sustainability. Based on survey findings, stakeholder interviews, and policy review, this section presents the empirical realities of MSWM in DNCC, the major challenges for WtE adoption, and opportunities to integrate WtE into an Integrated Solid Waste Management (ISWM) paradigm.

Realities of Waste Generation and Composition

DNCC generates an estimated 3,500–4,000 tonnes of municipal solid waste daily. Survey results also confirm that household waste consists mostly of organics (about 70% of the total volume), followed by plastics, paper products, metals, and glass. The most relevant aspect of the high content of organics and water is the reduction in calorific value of waste, which limits its direct incineration. Although anaerobic digestion and composting may seem better suited to this type of feedstock, they are less advanced municipally. Lack of systematic source segregation hinders the treatment process.

Figure 2: Waste Segregation is Significantly Lacking



Source: Researcher's Construct (2025)

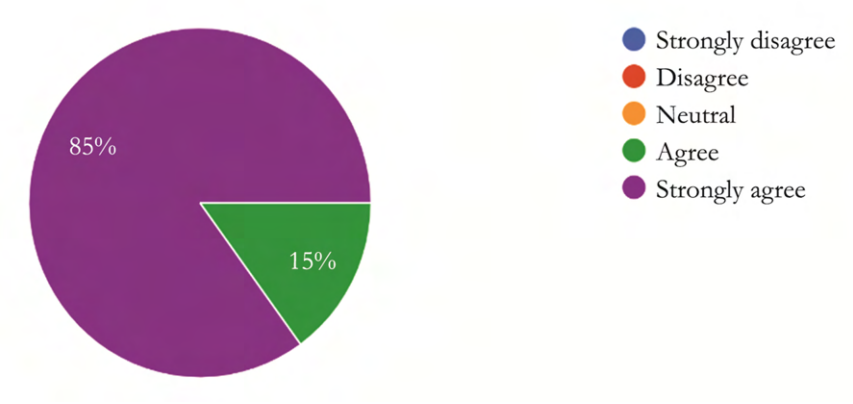
Collection and Transport Systems

People have come to accept the regularity of door-to-door collection. There is a shortage of waste collection vehicles in informal settlements, and for one to two days, refuse goes uncollected in some wards. Such lapses lead to insanitary conditions, blocked drains, and vector-borne diseases. Transport systems are partly mechanized with compactor trucks and dumpers, alongside manual rickshaw vans, but their capacity still lags behind the daily waste volume. Respondents often cited the inefficient integration of primary and secondary collection as a barrier, advocating for improved linkage in the waste chain.

Landfill Dependency and Its Consequences

The primary dumping zone of DNCC is the Aminbazar landfill. Some 80 feet above the ground, waste now towers in unstable heaps that spill over into neighboring land. Leachate plants and gas vents eventually fall out of service and are not maintained, leading to groundwater pollution, odor nuisances, and spontaneous surface fires. Villagers near Aminbazar say land prices are falling, and many are suffering from respiratory ailments and waterborne illnesses.

Figure 3: Landfill Activities Disrupted Local Livelihoods



Source: Researcher's Construct

With limited land available for expansion and strong community resistance, the landfill represents a critical vulnerability in DNCC's waste system.

Figure 4: Present Pictures of Landfill Site

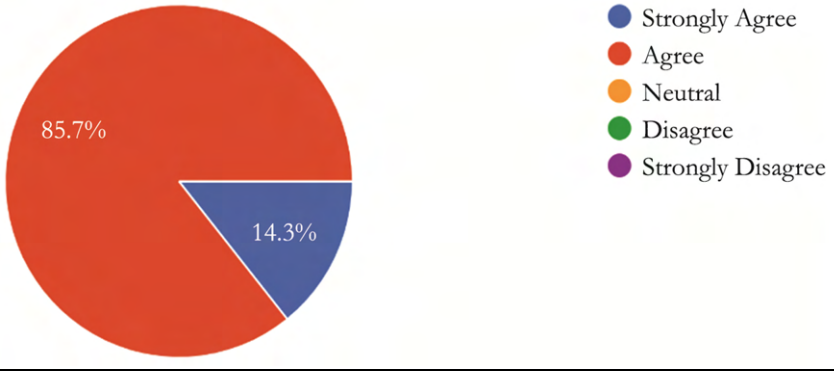


Source: Researcher's Construct (2025)

Institutional Readiness and Governance

Interviews with officials reveal broad recognition of WtE as a strategic priority for DNCC.

Figure 5: WtE Supports DNCC's Goal of Promoting Green Energy

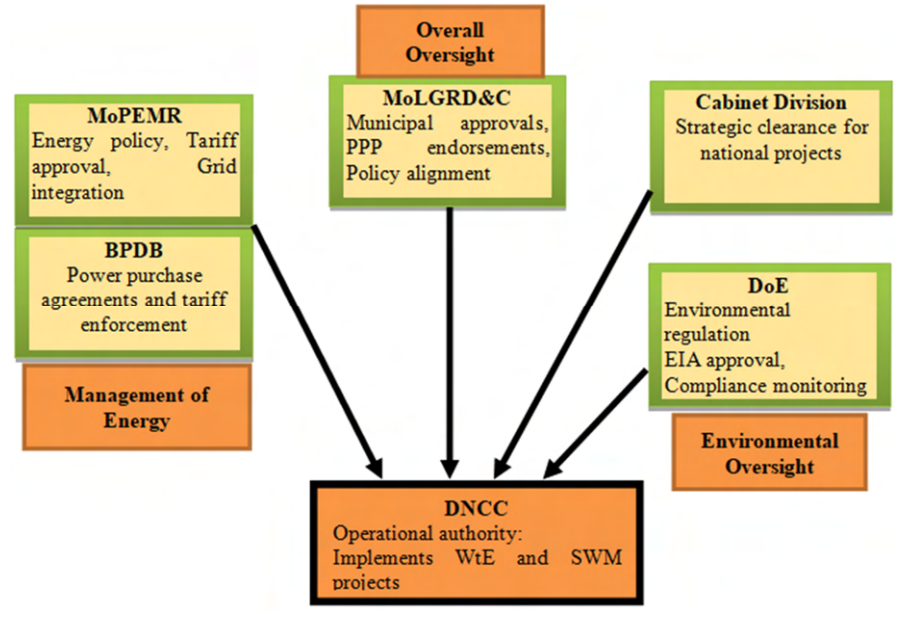


Source: Researcher's Construct

Although DNCC is responsible for collection and disposal, energy generation needs to be coordinated with the Bangladesh Power

Development Board (BPDB), Dhaka Electric Supply Company (DESCO), the Department of Environment (DoE), and the Sustainable and Renewable Energy Development Authority (SREDA). The absence of a single lead authority has created bureaucratic overlap.

Figure 6: Stakeholder Mind Map: DNCC WtE

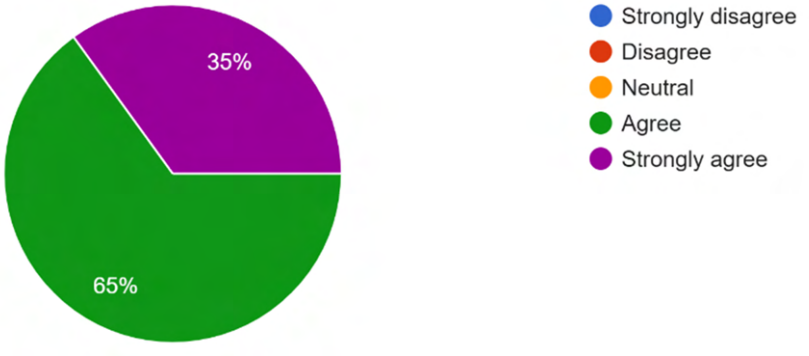


Source: Researcher's Construct (2025)

Public Awareness and Participation

Findings from the sample query indicate low public awareness of WtE. Only 35% of respondents were even aware of the idea, and fewer still had a good understanding of its potential risks and benefits.

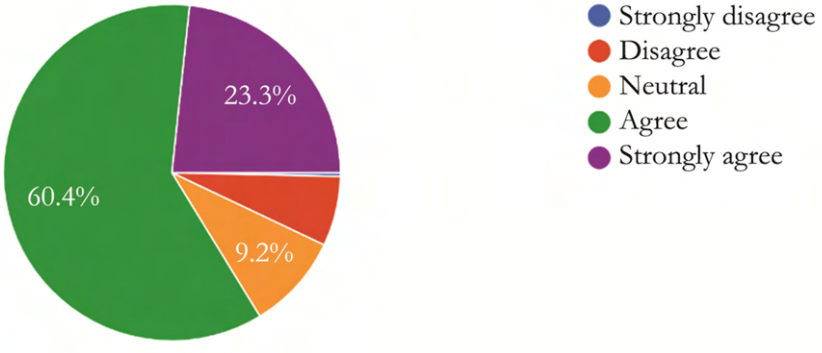
Figure 7: Aware of DNCC's PLan to Construct a WtE Incineration Plant



Source: Researcher's Construct

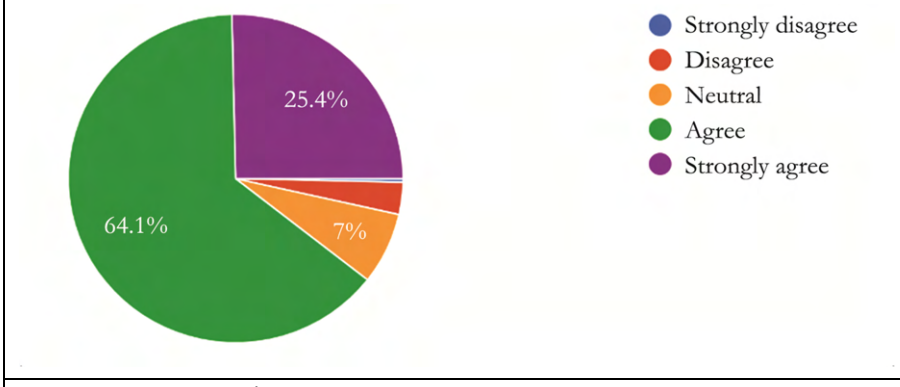
Waste has continued to be approached in a limited sense; not as waste but as disposal. This is resource recovery. According to the responses, there was a strong desire for WtE to be supported, provided it leads to cleaner neighborhoods, fewer odors, and lower health risks.

Figure 8: WtE Plant will Reduce Foul Odors from STS and Collection Point



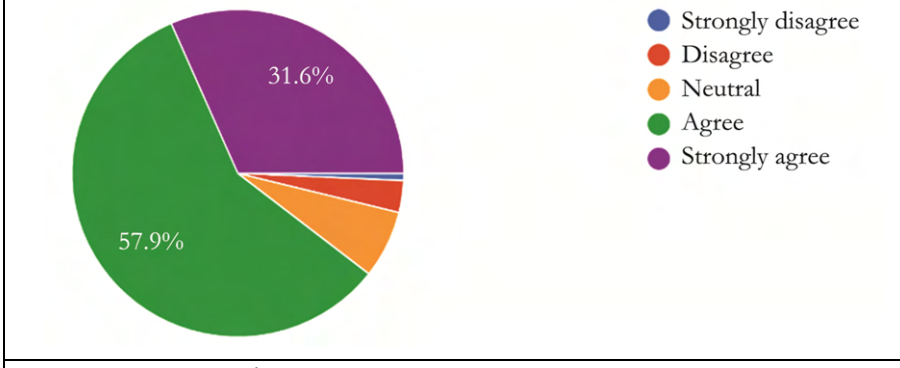
Source: Researcher's Construct

Figure 9: WtE will Improve the Drainage System



Source: Researcher's Construct

Figure 10: WtE will help to Improve Water Bodies



Source: Researcher's Construct

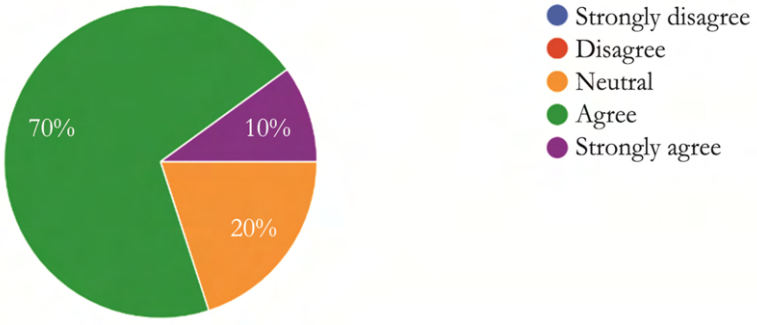
Private Sector Participation

It is also the city's first mega WtE project, in partnership with the Chinese concessionaire and DNCC, finally bringing Dhaka its first such facility. Private participation brings investment, technology, and know-how, but it also raises oversight issues. Stakeholders cited ambiguity around tariff structures and the potential for overreliance on foreign technology. Designing the plant around inadequate feedstock could result in lower efficiencies and even higher operating costs.

Key Challenges

- **Technical and Feedstock Mismatch**. The largest technical barrier is that Dhaka's raw municipal waste is not suitable for mass-burn incineration alone. The waste, with high moisture content (more than 60 percent) and low calorific value, restricts its incineration due to poor combustion quality.
- ·**Fragmented Institutional Governance**. The project's management is fragmented across several ministries and agencies (DNCC, Ministry of Local Government, Rural Development and Co-operatives (MoLGRD&C), Ministry of Power, Energy and Mineral Resources (MoPEMR), DoE, BPDB) with overlapping mandates but no comprehensive coordinating body. The resulting fragmentation causes regulatory holes, delays, and diffuse accountability.
- **Lack of Upstream Infrastructure**. The viability of the WtE plant largely depends on an effective upstream system, which is currently unavailable. There is no city-wide source segregation in place, and the number of Secondary Transfer Stations and modern collection trucks is inadequate.
- **Financial and Contractual Significance**. The reliance on a sale-only electricity model in the project's financial structure creates a perverse incentive to increase waste tonnage rather than minimize residual waste and maximize recycling. The conditions also do not specify performance monitoring and long-term assurance of feedstock.
- **Environmental and Societal Issues**. There are both public and regulatory concerns about the potential release of hazardous pollutants, such as dioxins/furans, and about the safe landfilling or disposal of toxic fly ash.

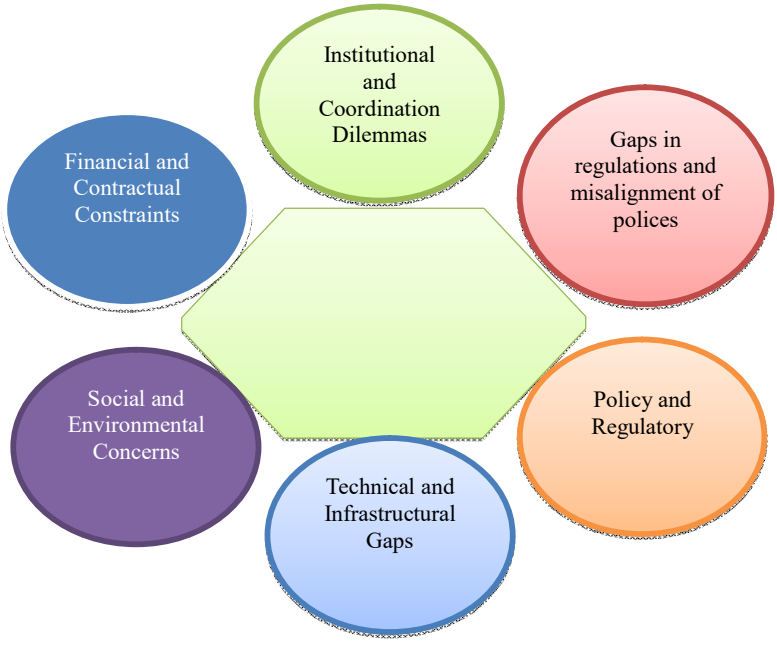
Figure 11: WtE Plant may Create Environmental Problems



Source: Researcher's Construct

It also endangers the livelihoods of around 40,000 informal waste workers without a clear "just transition".

Figure 12: Structural and Systemic Barriers to DNCC's WtE Initiative

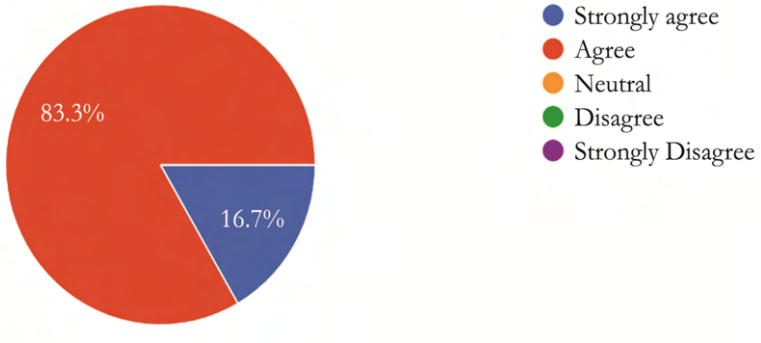


Source: Researcher's Construct

Key Opportunities

- **Significantly Reduced Waste sent to Aminbazar Landfill**. The project provides a strategic response to the chronic shortage of landfills and could reduce the amount of refuse sent there by up to 90%. This tackles a major environmental and public health problem head-on.

Figure 13: WtE Plant will Reduce Landfill Dependency



Source: Researcher's Construct

- **National and Global Relevance**. The WtE plant is consistent with Bangladesh's national policy framework on renewable energy and climate resilience, including the Power System Master Plan 2016-2041 (PSMP) and the National Adaptation Plan. It also contributes to the fulfillment of several UN Sustainable Development Goals (SDGs 7, 11, 13).

- **Catalyst for a Circular Economy**. The project may be an important catalyst for driving systemic reform, including mandatory source segregation, operationalization of EPR, establishment of markets for recycled materials, and ash retrofits to incinerators.

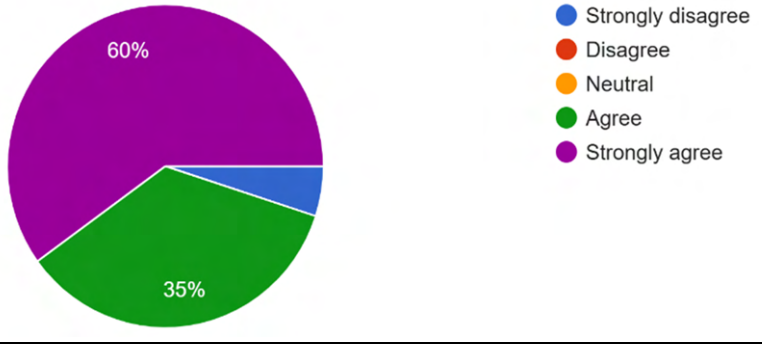
Figure 14: Opportunities Emerging from WtE Project



Source: Researcher's Construct

- **Economic Development and Green Jobs**. The WtE Plant will stimulate local economic activity and create skilled 'Green jobs' from operation, maintenance, and environmental monitoring. It is also a chance to formalize the informal waste sector, thereby providing safer, more stable jobs.

Figure 15: WtE will create Job



Source: Researcher's Construct

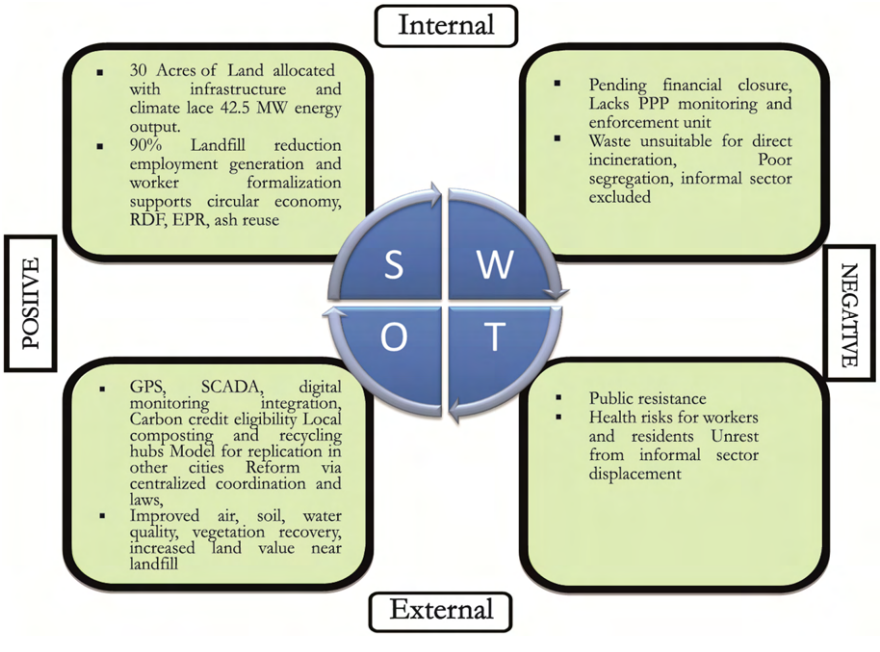
- **Diversification of Energy Supply**. The project produces 42.5 MW of non-fossil-fuel generation near a major urban load center, enhancing energy security and reducing grid congestion by lowering transmission and distribution losses.

Strategic Analysis of WtE Project

SWOT Matrix

A SWOT matrix provides an overview of the project's internal strengths and weaknesses and its external threats and opportunities that influence its implementation. The tool is built based on stakeholder discussions, field FGDs, technical analysis, and policy review.

Figure 16: SWOT Matrix



Source: Researcher's Construct

TOWS Matrix

Some of the positive contributors to the DNCC's WtE plant are alignment with national energy and waste policies, the availability of a site, and a 30-acre Build-Own-Operate-Transfer (BOOT) with an experienced concessionaire. These facets attract investment in climate finance, carbon credit investments, and expertise, while promoting green job creation to build a circular economy. However, the positives are offset by negatives such as looser governance and weaker technical expertise. Possible ways forward include optimizing waste pre-treatment and further implementation of the producer responsibility principle. These include the absence of regulation, environmental emissions, and public skepticism.

Table 3: TOWS Matrix

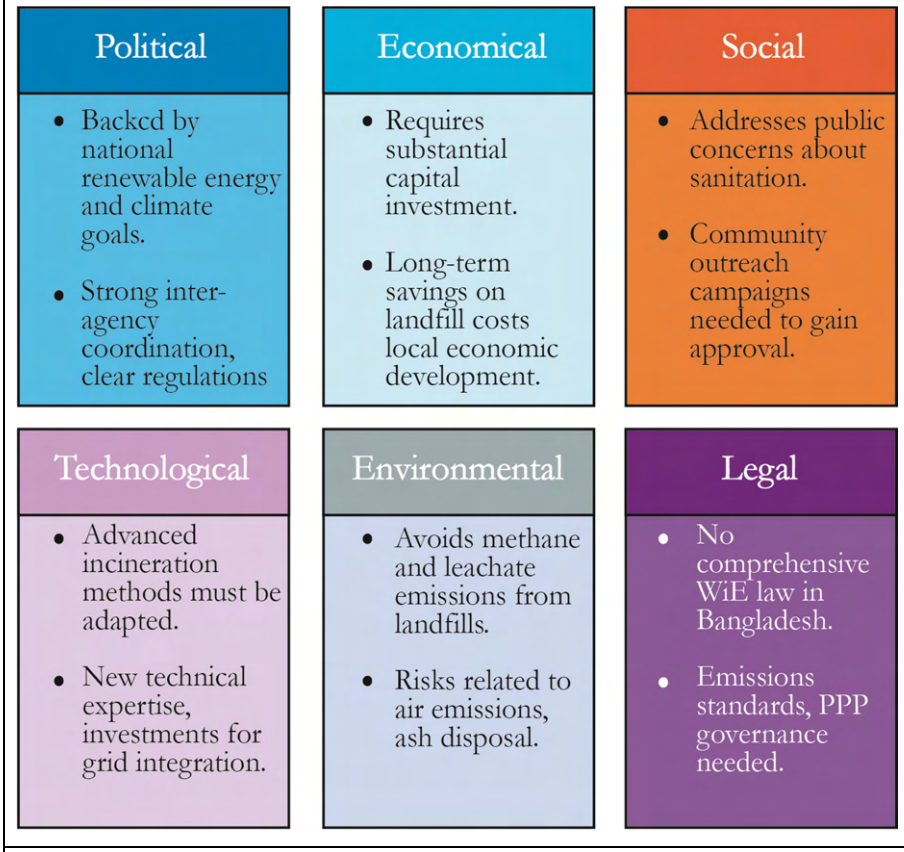
Strengths (S)	Opportunities (O)	Threats (T)
	SO Strategies • Leverage national energy alignment to draw international innovation investment. • Use BOOT agreement to build up scalable RDF and EPR programmes. • Use climate finance and carbon credits to incentivise the circular economy and create green jobs.	**ST Strategies** • Leverage political support and the reputation of concessionaires to drive regulatory reform. • Use carbon finance for offsets and enhance environmental perception.

Weaknesses (W)	• **WO Strategies** • Reform policy structures to foster investment in composting and recycling. • Develop technical capacity to service pre-treatment infrastructure (i.e., RDF).	• **WT Strategies** • Strengthen institutional capacity to address regulatory gaps. • Improve waste segregation and PPP enforcement to reduce public uncertainty and resistance.
Source: Researcher's Construct		

Political, Economic, Social, Technological, Environmental and Legal Factors (PESTEL)

Politically, the Aminbazar project is supported by national renewable energy and climate goals, but it needs robust inter-agency co-operation and specific rules. The financial rigor required for such a project will require large capital injections and the creation of secure revenue streams through PPAs, tipping fees, or carbon credits. However, it can promise reduced landfill costs over the long term and support local economic activity. Socially, it helps address public health concerns by creating green employment opportunities. Cutting-edge incineration techniques must be tailored to the high moisture content of Dhaka's waste.

Table 4: PESTEL Analysis

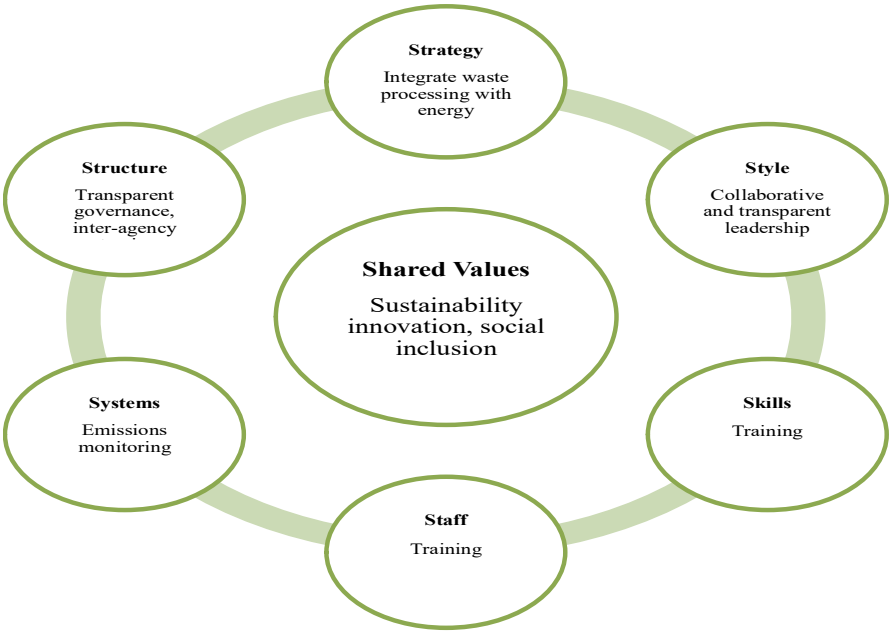


Source: Researcher's Construct

McKinsey 7S Framework

Internally, everything is in place within the organization. A master plan should link waste processing to energy and urban development objectives, leverage Public-Private Partnerships (PPP), and incorporate circular economy concepts. A clear governance structure is necessary to coordinate efforts of DNCC, utilities, regulators, and concessionaires. Alignment with the 7S framework will enable DNCC to deliver its current projects and remain sustainable in the future.

Figure 17: McKinsey 7S Framework



Source: Researcher's Construct

Discussion

The empirical findings of this research converge on the identification that the project's success hinges far less on the incinerator technology itself, which is proven globally, and far more on the systemic reforms. The technical challenge of a low-calorific, wet feedstock is not an isolated problem; it is a direct and predictable symptom. Not enforcing a city-wide source segregation policy, as mandated by the 2021 Solid Waste Management Rules, is the root cause of the poor waste quality. It is worth mentioning that the project excluded the informal sector. This demonstrates unequivocally that the project's primary risk is institutional, not technological.

The strategic analysis included in the present study supports this conclusion. It is found from the SWOT analysis that the project has both internal strengths and weaknesses, such as fragmented governance, weak enforcement capacity, and a lack of technical expertise in pre-treatment issues, as well as external strengths, including high-level political support and a secured site. The PESTEL analysis identifies a strong political environment supporting renewable energy, but a lack of legal and regulatory alignment for WtE. Lastly, the McKinsey 7S framework indicates an important misfit between the project's bold strategy and the current systems, skills, and shared values of DNCC and its partners, suggesting a moderate level of institutional readiness.

However, the WtE initiative is also a rare, powerful opportunity to generate desperately needed systemic change. This can become the keystone to establish a real ISWM process that any city has faced so far. By establishing a transparent, commercial demand for feedstock of a certain quality, the plant can also incentivize both political and economic 'push' downstream to impose source segregation, formalize the informal sector, and implement EPR. The project may reduce dependence on the landfill by up to 90%, abate fugitive potent methane emissions, and provide significant support and make a significant contribution to Bangladesh's clean energy targets, which in turn relate to several SDGs. The lesson of WtE success abroad is that incinerators are in the mix but not at the top. For Dhaka, this will mean the WtE plant must be carefully designed and allowed to process only genuine residual waste that cannot be recycled or composted.

Recommendations

- **Create a WtE Senior Steering Council**. Policies should be coordinated by a special council, headed by the Prime Minister's Office or Local Government Division. Such a body could help streamline standards and approvals, end bureaucratic silos, and speed decisions.

- **Enforce Source Segregation**. The public should promote compliance with two-bin wet-and-dry systems through ongoing education campaigns and strong incentives.

- **Digitize the Waste Chain**. An Internet of Things system that tracks waste from individual households to transfer stations and the WtE plant would improve visibility and facilitate effective management.

- **National Strategy to be Developed for Management of Ash**. The outcomes of WtE have to be managed safely. The bottom ash can be used in construction and requires controlled treatment, while the hazardous fly ash must be managed under strictly regulated procedures.

- **Mandate Continuous Emission Monitoring**. Real-time monitoring systems for pollutants such as nitrogen oxides, sulfur dioxide, particulate matter, and dioxins must be installed at the WtE stack.

- **Establish An Exclusive Project Implementation Unit (PIU)**. A PIU within the DNCC should be created to monitor contract compliance, technical efficiency, and environmental standards.

- **Include Informal Workers in a Just Transition Strategy**. Informal waste pickers and recyclers now help in diverting material from landfills. Not only would these jobs disappear, but so too would recycling performance. A just transition plan needs to offer training, protective gear, and pathways.

- **Operationalize Extended Producer Responsibility (EPR)**. Well-designed EPR strategies could reduce the quantities of problematic materials entering the municipal stream and provide higher-quality feedstock for WtE.

Conclusion

DNCC is at a crossroads in managing municipal solid waste. The Aminbazar landfill, overburdened and poised for capping, has exposed the inadequacies of a disposal-driven system that relies heavily on it, amid the city's rapid urbanization and daily waste generation exceeding 4,000 tonnes. This same site was considered and planned for development as a sanitary facility but instead sits today as an unregulated dump spewing methane, leachate, and toxic smoke onto surrounding populations, causing adverse impacts on public health, environmental sustainability, and urban viability.

WtE at Aminbazar, with a daily waste capacity of 3,000 tonnes and the ability to generate 42.5 MW of power, has been framed as an antidote to reliance on landfills and as part of Bangladesh's renewable energy targets. However, according to this study's results, the project cannot stand on its own. Institutional disintegration, poor financial recovery mechanisms, and a lack of public awareness are all contributing to vulnerabilities.

The main finding of this research is that WtE should be part of an Integrated Sustainable Waste Management (ISWM) and circular economy approach. Technology is just one component of the equation. The Aminbazar project should be considered not merely as a power station but as an engine for reconsidering the city's entire waste-governance mechanism.

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MANAGEMENT OF HAZARDOUS MATERIAL FOR GREEN SHIP RECYCLING AS PER HONG KONG CONVENTION 2009: A STUDY OF SHIP RECYCLING YARDS IN BANGLADESH

Commodore A H M Rafiqul Islam, (E), NUP, ndc, psc, BN

Introduction

Hong Kong Convention (HKC) outlines Ship Recycling as "the activity of complete or partial dismantling of ship at a ship recycling facility in order to recover components and materials for reprocessing and reuse, whilst taking care of hazardous and other materials and includes associated operations such as storage and treatment of components and materials on site but not their further processing or disposal in separate facilities" (IMO, 2009). The International Maritime Organization (IMO) introduced HKC to reduce adverse effects of poor ship recycling practices on human health and the environment, with the ultimate aim of safe recycling. Green ship recycling generally refers to recycling end-of-life vessels while paying due regard to worker safety and minimizing ecological pollution. Ship recycling has proven an effective method of resource recovery in Bangladesh, with almost 90% of scrapped materials reused. Since it emerged as a ship-recycling nation, Bangladesh has been actively working to strengthen its alignment with international best practices in workplace safety and the environmentally responsible handling of Hazardous Materials (HAZMAT). Therefore, if HAZMAT management practices in green ship recycling facilities are not fully aligned with HKC for the Safe and Environmentally Sound Recycling of Ships and other international regulations, Bangladesh may face challenges in sustaining its competitiveness in the global ship recycling market.

Review of Literature

It is apparent from the poor structural enhancement of ship recycling yards in developing countries that they use basic facilities regarding HAZMAT management (Ormond, 2012). In this regard, Mathew (2021) stated that ship owners and ship recyclers find it cost-effective to carry out ship recycling without incurring high costs for protecting public health and the environment, due to relatively weak regulatory enforcement mechanisms in developing countries.

Zungfeng Du, 2018 adopted a comprehensive approach to examine ships' HAZMATs, and his paper presented various methods of removal and green disposal of HAZMATs in the ship recycling process of Chinese ship recycling yards. Ali & Pearce (n.d.) stated that the beaching method, as used in Bangladesh during ship-breaking, allows toxic materials to fall directly into seawater, resulting in water pollution, soil contamination, soil erosion, pollution of coastal areas, and loss of biological diversity. While discussing the fundamental difficulties of the ship-breaking industry in Bangladesh, Zakaria et al. (2012) highlighted that effective management of HAZMATs such as asbestos, Poly Chlorinated Biphenyl (PCB), Ozone-Depleting Substances (ODS), and heavy metals was practically lacking. They advocated specialized training for workers to identify and handle HAZMATs. Sarraf (2010), in a World Bank study, found a large accumulation of HAZMATs over time in ship-dismantling areas in Bangladesh due to improper management. In this context, the study reveals that developing various facilities for HAZMAT management (storage, treatment, and disposal) is not only an expensive necessity to meet the provisions of HKC but also to fulfill obligations under the EU Ship Recycling Regulation (EU SRR). Vardar (2009) emphasized that hazardous waste must be sent to a facility for final disposal that has a robust system of monitoring and auditing and is in compliance with environmental protection and occupational safety requirements. He pointed out that the downstream management of hazardous waste in an eco-friendly manner is of paramount importance for environmentally benign shipbreaking practices.

In its report (MARPROF, 2024), it emphasized the inherent problem of downstream waste management of ship recycling in Bangladesh. (Zhou, et al., 2021) noticed that the disposal of HAZMAT is a vital factor affecting green ship recycling, and they stressed the importance of ship recycling technologies that ensure workplace safety and protect the surroundings. In this context, Mathew (2021) suggested establishing a ship-recycling fund by donor organizations or countries to finance HAZMAT treatment technologies.

Research Methodology

Primary data on the perceived risks of HAZMATs, current practices at recycling yards, and international best practices in HAZMAT management have been collected through Interviews and Focus Group Discussions (FGDs). Secondary data concerning the management of HAZMAT have been collected through a literature review of journals, articles, publications, reports, and documents. Core principles of HAZMAT management, in light of the IMO Guidelines (HKC 2009) and national and international legal frameworks, have been taken into account to fulfill the Convention's legal obligations. International best practices for green removal, storage, and disposal methods of HAZMATs have been reviewed. In-depth interviews with 15 people have been carried out with Ship Recycling Consultants and related personnel in the field of ship recycling. An FGD comprising 12 participants was conducted to gather expert opinion on the management of HAZMAT. Thereafter, primary and secondary qualitative data were analyzed to propose management methods of HAZMAT in Bangladesh for green ship recycling in light of HKC.

Qualitative Data Collection Method

Interviews. Interviews have been used as a standard method of data collection to explore the views, experiences, beliefs, and motivations of different participants. Therefore, to meet the objectives of the research, semi-structured interviews have been conducted with participants

comprising policymakers, academic scholars, public officials, ship-recycling consultants, and other stakeholders in the field of recycling.

Focus Group Discussion (FGD). FGD is a typical data collection method that uses group interactions to generate qualitative data and is useful for understanding participants' experiences and beliefs on the subject. An FGD has been arranged to gather expert opinions on HAZMAT management from policymakers, academic scholars, public officials, ship recycling consultants, and other relevant stakeholders in the field.

Qualitative Data Analysis Procedure

General. The qualitative data obtained from FGDs and semi-structured interviews were analyzed using Thematic Analysis, which is suitable for identifying and interpreting patterns of meaning across a dataset. The six phases of thematic analysis (familiarization of data, generation of initial codes, generation of initial themes, review of themes, naming and defining of themes, and report writing) guided methodical identification, analysis, and interpretation of patterns of meaning across qualitative data (Clarke, 2006). Themes were developed, refined, and cross-checked after coding to ensure they accurately reflect the data rather than preconceived ideas. Audit trails and peer debriefing were conducted to ensure judicious assessment of the findings and transparent documentation, so that the analysis remains rational and defensible under academic scrutiny.

Theme Development and Refinement. Replies and comments from Interviews and FGDs were grouped into broader categories and then further refined into themes and sub-themes to align with the research objectives. Themes were reviewed to ensure that they accurately represent the underlying data, and thematic saturation was achieved when no new themes or insights emerged from the data.

Interpretation and Integration. The identified themes were interpreted in the context of the theoretical framework and existing literature. Data from FGDs and Interviews were compared and integrated to identify converging and diverging viewpoints across different stakeholder groups.

Results and Discussions

The qualitative data collection method consisted of 15 semi-structured interviews and 1 FGD with policymakers, academic scholars, public officials, ship-recycling consultants, and stakeholders in the field. Respondents were denoted as Respondent 1, Respondent 2,… and Respondent 15, respectively. The interviews and FGD focused on the perceived risks of HAZMATs, current HAZMAT practices in Bangladesh, and a review of best practices worldwide. The data collection process included a combination of open-ended and closed-ended questions on perceived risks, current practices, and best practices of HAZMAT management. *Table 1* highlights key concepts of Theme and Sub-Theme in relation to the study's objectives.

Results from Interviews. The interview aimed to explore current HAZMAT management practices, perceived risks, and their implications for human health, the environment, and society. The interviewees were divided in their opinions, stating that current HAZMAT management practices differ considerably between HKC-compliant and HKC-non-compliant ship recycling yards. In contrast, they shared similar views on the detrimental effects of poor HAZMAT management on public health, the environment, and society. However, most respondents agreed that a Treatment, Storege and Disposal Facilities (TSDF) should be established to manage HAZMAT better. In this regard, respondent 11 rightly pointed out that "TSDF establishment can be a game changer for HAZMAT management ….it will streamline the management of all types of HAZMAT including the downstream waste management." While

reviewing the selected international best practices on HAZMAT management through interviews, it appeared that such practices are rarely available.

Nevertheless, the issue of establishing a TSDF for HAZMAT management repeatedly came up in interviews, where respondent 2 highlighted in particular that "Bangladesh can benefit greatly from international best practices such as: Centralized TSDFs as seen in the EU and Japan, which can ensure safe and environmentally sound disposal." Similarly, respondent 2 stressed the development of a skilled workforce for HAZMAT management through training and proposed "Certified Training Programs for workers based on IMO Model Courses, ensuring a skilled workforce for handling hazardous waste." Besides, interviewees discussed digital IHM & HAZMAT tracking systems used in South Korea and Turkey, as well as third-party audits practiced in the EU, which can ensure transparency and accountability.

Results from FGD. The FGD participants mentioned that green ship recycling yards in Bangladesh recycle HAZMATs so they do not return to the environment, citing asbestos as an example that is retained in yards for extended periods. Respondent 3 said that there has been recent progress in infrastructure development, and yards are making steady progress in recycling. However, Respondent 11 differed in opinion from Respondent 3 by mentioning that, "At present, Asbestos is solidified and kept in temporary storage for future landfilling in TSDF, and DoE-approved vendors are managing other HAZMATs, and there is a lack of proper infrastructure in recycling yards." It was also discussed that ship recycling yards are making moderate progress in light of the HKC regarding HAZMAT management. Respondent 9 highlighted the necessity for HAZMAT tracking, monitoring, and disposal systems. Respondent 8 pointed out that there are no testing facilities in ship recycling yards to identify undocumented HAZMAT. Respondent 4 and Respondent 11

stressed the need for a 'One Stop Service' to be introduced by activating BSRB. Respondent 2 mentioned that under the purview of HKC, the Competent Authority (CA) is responsible for monitoring the ship recycling process. However, a 3rd-party inspection may be conducted to verify the completeness of the recycling process. The participants unanimously agreed to establish a TSDF to manage HAZMAT in Bangladesh better.

Table 1: Key Concepts of Theme and Sub-Theme

Objective (i): Perceived risks of Hazardous Material with Implications on Human Health, Environment and Society	
Elements	**Definition**
Theme 1: Perceived Risks of Hazardous Material on Human Health, Environment and Society	Highlights various human health, environmental, and social risks associated with hazardous materials, given HKC's non-compliance.
Sub-theme 1: Human Health Concerns	Focuses on risks that are directly affecting human health.
Sub-theme 2: Environmental Concerns	Highlights concern about the detrimental environmental impact.
Sub-theme 3: Social Implications	Represents concern about the social implications of economic changes (shifts in employment, loss of income sources, and social mobility) resulting from the loss of Bangladesh as a current market for ship recycling.
Objective (ii): Current Practices of Removal, Containment and Disposal of Hazardous Material in Existing Ship Recycling Yards of Bangladesh	
Theme 2: Current Practices of Hazardous Material Management	This theme reflects how current HAZMAT management practices comply with HKC.

Sub-theme 1: Current Practice of HAZMAT Removal	Highlights the current practice of HAZMAT removal in relation to HKC compliance.
Sub-theme 2: Current Practice of HAZMAT Containment	Focuses on the current practice of HAZMAT containment in relation to HKC compliance.
Sub-theme 3: Current Practice of HAZMAT Disposal	Addresses the current practice of HAZMAT disposal in relation to HKC compliance.
Objective (iii): Review of Selected International Best Practices for Hazardous Material Management in Ship Recycling Yards of Bangladesh	
Theme 3: Review of Selected International Best Practices on HAZMAT Management	This theme reviews selected international best practices for HAZMAT management.
Sub-theme 1: Influence of Best Practices on HAZMAT Management of Bangladeshi Ship Recycling Yards	It reflects how selected international best practices can shape HAZMAT management in ship recycling yards of Bangladesh.
Sub-theme 2: Relevancy and Applicability of Practices	Focuses on the relevance of international best practices and their applicability in Bangladesh.
Sub-theme 3: Perceived Gaps in Practices	Highlights the effects of insufficient information on international best practices for making appropriate choices in HAZMAT management in Bangladesh.
Source: Researcher's Construct	

Discussion and Analysis of Findings

Preamble. The qualitative data identified three main themes: perceived risks of HAZMAT on human health, the environment, and

society; current HAZMAT management practices; and a review of international best practices on HAZMAT management. The themes are then subdivided into sub- themes. The identified themes are interpreted in the context of the theoretical framework and existing literature. The discussion and analysis of findings are as follows:

Theme 1: Perceived Risks of HAZMAT on Human Health, Environment and Society

The issue of perceived risks of HAZMAT concerns how respondents perceive it as a menace to human health, the environment, and society. Respondents indicated concerns about the consequences of HAZMAT, which can be devastating in terms of saving lives, communities, and the future due to malpractice in ship recycling. This reflects current discourse on HKC for safe and sound ship recycling, aimed at addressing the detrimental effects of poor ship recycling practices on workers' health, the environment, and society. In this respect, Respondent 9 said, "Cancerous and life-threatening diseases will slowly result in the untimely death of the workforce." Similarly, Respondent 6 mentioned, "If hazardous materials are not handled properly, it will affect human health directly, the environment, and also the society." This observation aligns with a 2009 report by the UN Human Rights Council Special Rapporteurs, which highlights how the improper handling and disposal of hazardous wastes undermine human rights, including the right to health and safe working conditions (ROSSI, n.d.). The respondents discussed the harmful environmental effects of ship recycling and its long-term social impacts. Toxic substances are often discharged into seawater, resulting in air and water pollution, contamination of coastal regions, and loss of biological diversity, due to the beaching of ships for recycling. As Respondent 12 noted, "….environmental issues then ripple into society; families bear the burden of costly medical treatment and entire communities may lose their livelihoods as fishing, farming and tourism collapse" supporting previous research linking pollution as a result of

recycling activities that adversely affects the human rights of workers and the adjacent populations who are relying on agriculture and fishing for their food (Rahman, 2017) (ROSSI, n.d.). This underscores the communal stance of relevant stakeholders in the ship recycling field, and divergence from perceived standards may result in social unrest. Various data analyses indicate that perceived risks of improper HAZMAT management are manifold, encompassing its harmful effects on public health, the environment, and society. Therefore, there is a dire necessity for 'accountable ship recycling' by minimizing 'preventable risks' to workers' safety and the environment. It is noteworthy that ISO 30000 and ISO 45001 provide frameworks for sound ship recycling by giving due regard to public health, safety, and the environment. Hence, incorporating ISO 30000 and ISO 45001 into the Shipbreaking and Recycling Rules, and the eventual certification of ship recycling yards, can ensure safe and sound ship recycling in Bangladesh.

Theme 2: Current Practices of HAZMAT Management

The second key subject focuses on current HAZMAT management practices in Bangladesh. Respondents relied primarily on their field observations in ship recycling yards. At the same time, Respondent 2 and Respondent 12 said, "Current practices are mixed" and "Some yards follow the best practices and some do not," respectively. Current practices demonstrate that developing countries lack a systematic approach to HAZMAT management and struggle to mitigate the adverse impacts of hazardous events (Daniel Mmereki, 2016). Respondent 3 responds that the "…waste is sometimes dumped or burned, lacking certified disposal facilities," proving the possible gaps between current practice and standard practice for compliance in light of HKC. As Respondent 9 noted, "…issue is the lack of skilled and certified manpower to handle HAZMATs, and the lack of technical know-how…" Respondent 10 opined that, "TSDF is a core missing link; without it, compliant disposal of hazardous

materials is virtually impossible." In this context, Respondent 11 reflected, "TSDF establishment can be a game changer for HAZMAT management ….it will streamline the management of all types of HAZMAT including the downstream waste management." On-site investigation by the Author revealed that ship-breaking yards have constructed storage rooms for hazardous waste, oily water separators, incinerators, oil storage tanks, and workers' rest rooms. The waste is temporarily stored in a place that has become a concern for ship-breaking yard owners. Hence, there is a dire need to establish a TSDF for the proper disposal of HAZMATs by ship recycling yards. Indeed, the development and operation of a TSDF require substantial capital; therefore, it would be difficult for a recycling State like Bangladesh to build and operate such a facility on its own. It requires 'international funding' for Bangladesh to build and operate a TSDF to comply with HKC. Workers in the shipbreaking industry have limited knowledge and resources to safely break ships and manage HAZMAT efficiently, putting workers' personal safety and the environment at risk. It is therefore necessary to arrange 'effective training' for the workers employed in the ship-recycling industry. Training can become part of the 'industrial culture' of the ship recycling industry by establishing a Training Institute. It is noteworthy that enforcing a sound HAZMAT management system in light of HKC is likely to be difficult in Bangladesh due to its limited technical and financial capacity.

In light of this, Vardar (2009) stressed the disposal of hazardous waste only to licensed facilities and advocated for a robust monitoring and auditing system to ensure that the facilities comply with environmental protection and workers' safety requirements. Since the onus of enforcing HKC lies with a resource-poor ship-recycling State like Bangladesh, a strong oversight mechanism is required. This can take the form of internal and external audits, as stated by Respondent 8: “Encouraging Third- Party Verification-Competent third party

could be involved to verify the whole process." Therefore, it is strongly felt that there is a need for a more comprehensive strategy for HAZMAT management that includes skill development through training and certification, the establishment of infrastructure TSDF, the incorporation of Marine Environment Protection Committee (MEPC) guidelines into the Bangladesh Ship Breaking Rules & Acts, and the formation of an oversight mechanism.

Theme 3: Review of Selected International Best Practices on HAZMAT Management

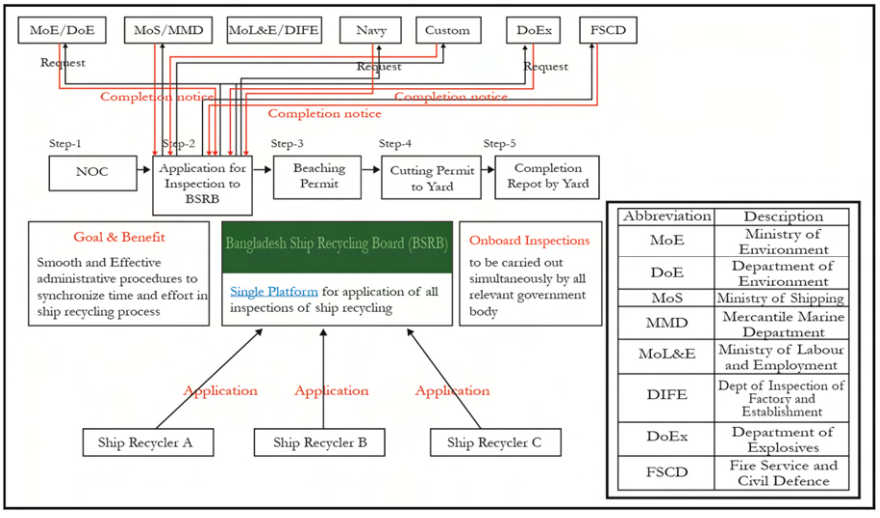
The final theme reviews selected international best practices for HAZMAT management in the ship recycling process. Participants spoke from their personal experience and sense of aspiration, while Respondent 4 noted, "… fostering collaboration with international waste handlers and technical experts will bring global knowledge and strengthen safe and environmentally sound practices within the country." Such narratives are consistent with Respondent 2, who holds that "Bangladesh can benefit greatly from international best practices such as: Centralized TSDFs as seen in the EU and Japan, which can ensure safe and environmentally sound disposal." In this regard, Respondent 2 also suggested that "Adoption of digital IHM & HAZMAT Tracking Systems like those used in South Korea and Turkey can improve transparency and accountability." The implementation of a digital platform for IHM and HAZMAT tracking enables automated record maintenance, significantly enhancing efficiency and accuracy compared to traditional manual record-keeping practices. However, Participants also discussed the difficulty of exposure to international best practices; in this respect, Respondent 12 mentioned that, "…regarding ship recycling, the international best practices are rare." This shows perceived gaps between international best practices and current HAZMAT management practices in the context of HKC in Bangladesh. This

accentuates the pressing need to develop indigenous technologies and methods that leverage local resources and skills rather than relying solely on foreign practice. Investment in research and innovation is essential for eco-friendly HAZMAT management and is likely to yield effective solutions tailored to local realities. There is no standard testing facility in Bangladesh to recognize HAZMAT, which is rightly pointed out by Respondent 1: "Identification of hazardous material in Bangladesh is a great challenge because of non-availability of standard testing laboratory. The nearest testing laboratory is in Shanghai (China) and Singapore". It is noteworthy that international best practices are rare in ship recycling, as few nations truly follow them. Hence, Bangladesh must foster collaboration with international experts on HAZMAT management in developing its 'capacity building'. The owner of a ship recycling yard is to apply for various types of inspections before scrapping a ship. Inspections often do not take place on time, even after the scrap ship arrives in Bangladesh, causing administrative and financial hassles for recycling yard owners.

In this context, Respondent 4 and 11 said that Bangladesh Ship Recycling Board (BSRB) needs to develop a system of 'One Stop Solution' in the ship recycling process. The concept of 'One Stop Service' shall provide a range of services to ship recyclers from a single BSRB platform. The ship recycler is to apply to BSRB for various inspections of a scrapped ship. BSRB is to notify various departments for inspection, with an ultimatum to provide the inspection report within a specified time. Besides, BSRB is to coordinate with various departments so that all types of inspections can take place simultaneously as far as possible. BSRB is to ensure that inspection becomes a 'time-bound activity' for various departments involved in the ship recycling process. This will provide a better understanding among departments and ship recyclers in areas of uncertainty in the recycling process and minimize the time required to complete inspections. Upon receipt

of inspection reports from all departments, BSRB shall permit a recycling yard to scrap a ship. The concept of such a 'One-stop service' is illustrated in Figure 1.

Figure 1: One Stop Service



Source: Researcher's Construct

Conclusion

The thematic analysis approach has been used in the study to examine the perceived risks of HAZMAT to human health, the environment, and society, as well as current and international best practices in HAZMAT management, using qualitative data from Interviews and FGDs. Various data analyses indicate that the perceived risks of HAZMATs are manifold, encompassing their adverse impacts on human health, the environment, and society. In addition, various data indicate that the consequences of improper HAZMAT management can be devastating for saving lives, communities, and the environment. Therefore, Bangladesh needs to regulate recycling activities for the very survival of its people associated with ship recycling. The various national and international regulatory

frameworks highlight the necessity for 'accountable ship recycling' by minimizing 'preventable risks' to public health and the environment. It is widely felt that basic guidelines for ship recycling should be incorporated into domestic laws and regulations, in light of the HKC and other international regulatory frameworks. The study found that ISO 30000 and ISO 45001 provide outlines for sound ship recycling by giving due regard to workers' safety and the environment. Hence, integrating ISO 30000 and ISO 45001 into the Bangladesh Ship Recycling Regulation and eventually certifying recycling yards can ensure safe and sound ship recycling in Bangladesh. There is a dire need to establish a TSDF to dispose of HAZMAT properly. However, it requires international funding for Bangladesh to build and operate a TSDF in order to comply with HKC. Moreover, it is necessary to arrange 'effective training' for the workers engaged in ship recycling.

Training can become part of the 'industrial culture' of the ship recycling industry by establishing a Training Institute. Since the onus of enforcing HKC lies with a resource-poor ship-recycling State like Bangladesh, a strong 'oversight mechanism' is required. This can take the form of internal and external (Competent Third-Party) audits to verify the entire ship recycling process in Bangladesh. 'One Stop Service' may be introduced as soon as possible to accelerate the ship recycling process. Implementing a digital platform for IHM and HAZMAT tracking will enable automated record maintenance, significantly enhancing efficiency and accuracy compared to traditional manual record-keeping adopted in existing practices. Since international best practices are rare, the study emphasizes the pressing need to develop indigenous technologies and methods that leverage local resources and skills rather than relying solely on foreign practice. Investment in research and innovation is essential for eco-friendly HAZMAT management and is likely to yield effective solutions tailored to local realities. Hence, there is a high need for Bangladesh to foster collaboration with international experts on HAZMAT management in developing its 'capacity building'

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INCLUSIVE EDUCATION FOR CHILDREN WITH DISABILITIES: THE CASE OF PRIMARY EDUCATION DEVELOPMENT PROGRAM IN BANGLADESH

Joint Secretary Rokeya Khaton, ndc

Introduction

Internationally and constitutionally, Bangladesh is obligated to uphold the right to education for all children. To attain this goal, the government endorsed the Education for All (EFA)/1990 framework; adopted the National Education Policy/2010; and taken various initiatives to ensure equitable and Wide-ranging quality education by 2030 to meet the promise of Sustainable Development Goal 4 (SDG 4) (Haque & Kabir, 2022). Further, Primary Education Development Programme (PEDP) was introduced as an integrated inclusion strategy into the national primary education sub-system (Azam, 2015). Moreover, the country has ratified the Convention on the Rights of the Child (CRC)/1990, the Salamanca Statement and Framework for Action on Special Needs Education (SNE)/1994, the Dakar Framework for Action/2000, and the Convention on the Rights of Persons with Disabilities (CRPD)/2006 (Srivastava, Boer & Pijl, 2015).

Problem Statement

Children make up about 26% of Bangladesh's population, and an estimated 3.62% of those aged 2–17 live with a disability (BBS, 2022). Evidence suggests disability is more closely linked to non-enrolment than gender or class, and Children with Disabilities (CWDs) are among the most disadvantaged when it comes to finishing primary school (Alam, 2023). Even in one of the world's largest primary education sub-sectors, enrolment among school-age CWDs is only 40.41%, compared with 84%

for non-disabled children (BBS, 2022). Attendance is also consistently lower for CWDs of the same age (Alam, 2023). While the government highlights Wide-ranging education as part of achieving EFA, turning that goal into reality remains difficult (Khaton, 2016). This is why examining how PEDP has performed in ensuring IE is so important.

Research Objectives

To understand IE as a means of mainstreaming CWDs into the primary education sub-sector:

- To review the status of PEDP,
- To examine the performance of the PEDP for CWDs based on equity considerations,
- To provide policy-level and operational recommendations for more effective IE for CWDs in Bangladesh.

Significance of Study

Over the past 30 years, the Bangladesh government has introduced several IE policies at the primary level, but the results still fall short of their intended objectives (Alam, 2023). However, there is still limited research on children's rights to equal and equitable access to schooling. Very few studies have evaluated PEDP in terms of promoting IE for CWDs. For example, Das et al. (2021) explored IE from a socio-economic perspective but did not address PEDP 4, whereas Ainscow (2020) discussed equity without focusing on CWDs in primary schools. Existing literature lacks a review of all PEDP phases to ensure IE for CWDs through an equity lens. This study aims to fill that gap and offer practical recommendations for future implementation of PEDP5. Therefore, this study will provide a basis for further research into evidence-based IE policy practice for CWDs through an equity lens. Further, it will incorporate new knowledge and benefit other researchers, policymakers, policy practitioners, and development partners through the study's practical, field-level findings.

Key Concepts

Inclusive Education (IE)

The lack of a common definition of IE remains a debated issue globally. Kearney (2011) identified IE as a special educational arrangement for vulnerable students, such as CWDS, ethnic groups, and students from rural areas. Dixon & Verenikia (2007) and Namanyane & Shaoan (2021) discussed a social justice view of IE, which refers to a whole-school approach to ensuring education for all children. Anis (2022) described the perspectives of IE as participation, diversity, and addressing different needs. Consistent with various international policies and governments' reform agendas, Azam (2015) identified IE as a means of bringing all children into regular schools. UNESCO (2021) introduces IE as an ongoing process for quality education by eliminating discrimination. Ainscow (2005, 2020b) opined that the human rights perspective of IE emphasizes social inclusion.

Disability

Like IE, disability also lacks a universal definition. In general, disability is considered a limitation on equal opportunities to participate in normal life due to physical and social challenges (Williams, 1996). In Bangladesh, the Persons with Disabilities Welfare Act/2001 defines a person with disability as someone physically or mentally incapacitated either congenitally, through disease, accident, maltreatment, or other causes, who cannot lead a normal life (DPE, 2024).

Different Models of Disability

Earlier, disability was described through the medical model, focusing on individual impairment as the cause of disadvantage (Barnes & Mercer, 1997). In contrast, Zola (1988) introduced a sociological medical approach that combines the physical and sociocultural dimensions of disability, both of which are absent in Medical Models. Later, Abberley

(1987) and Oliver et al. (1988) mentioned the Social Model, which considers disability as a marginalized group, emphasizes social capital, and focuses on identifying and addressing various problems with care (Forlin & Sin, 2010). In contrast, Zola (1988) introduced a sociological medical approach that combines the physical and sociocultural dimensions of disability, both of which are absent in Medical Models.

Children with Disabilities (CWDs)

CWDs are the most vulnerable part of society (Namanyane & Shaoan, 2021). They are the most marginalized group in education (Ahsan, 2025). IE has become an important policy agenda to bring CWDs into the mainstream education system at the primary level. This study critically examines IE policy initiatives in Bangladesh to determine their effects on CWDs through the lens of the right to equity.

Equity

Although equality and equity are commonly used together, there is a clear difference between the two concepts. Equality assumes similar opportunities for everyone, thereby ignoring the distinct needs of marginalized groups (Khaton, 2016). On the contrary, equity ensures fair support based on needs and continues it until a level playing field is possible (UNESCO, 2017). In education, equity refers to "the attainment of fairness, justice, and impartiality to all children under the same roof to thrive adequately" (Haque & Kabir, 2022, p. 2). Ainscow (2020a) and Hong (2024) opine that the best education system combines equity with high quality.

Global IE Initiatives

Globally, various policy frameworks have been adopted promoting IE. The Salamanca Statement and Framework for Action on Special Needs Education (1994), adopted by UNESCO, was a pioneering policy reform in this arena (Azam, 2015). Later, the UNESCO-led Dakar Education for All (EFA) Framework for Action/2000, the UN

Convention on the Rights of Persons with Disabilities (UNCRPD)/ 2006, Millennium Development Goals (MDGs)/2015, and Sustainable Development Goals (SDGs) became the most significant international agreements and forms of legalization of the education movement for the right to IE (Anis, 2022). In line with various global agendas, developing countries, including Bangladesh, have adopted IE policies to reform their education sectors. Internationally, the Organization for Economic Cooperation and Development (OECD) countries are well known for their prudent IE policies. Australia has one of the best education systems for ensuring quality and fairness (Sciffer, 2023). Likewise, Finland's education system is renowned for its equity and excellence, achieved through its teaching-learning model (Mandavka, 2024). However, assessing IE is challenging because there is no universal benchmark (Anderson & Boyle, 2015). Approaches to IE vary due to country-specific factors (Ackah-Jnr, 2020).

Promoting IE for CWDs in Bangladesh

In Bangladesh, IE in the primary education sub-sector is run by the Directorate of Primary Education (DPE) under the Ministry of Primary and Mass Education (MoPME). Bangladeshi Government initiated EFA to reduce poverty, increase literacy rate, and improve the quality of life for children (Siddik & Kawai, 2020). The Primary Education Development Program (PEDP) in Bangladesh is one of the largest sector-based programs in the world (DPE, 2024). The PEDP is the pioneering policy initiative at the primary education level for achieving EFA and IE (Malak et al., 2014). A series of programmes, including PEDP I (1997-2003), PEDP II (2004-2011), PEDP III (2011-2017), and PEDP IV (2018-2026), were introduced in this regard (Naher & Maitles, 2020). Further, the Primary Education Stipend Project (PESP), the Reaching Out of School Children (ROSC), and the Mid-Day Meal Program support the nation's educational destination (Azam, 2015). These initiatives aim to provide EFA without discrimination on the basis of gender, disability, religion, or ethnicity, in compliance with IE (Hanif,

2022). Thus, IE policy implications are needed to ensure education for CWDs in the country.

Existing Literature Gaps

The literature review clearly canvassed that many studies on IE in Bangladesh exist. However, very few of them closely examined PEDP-related policy issues, and none reviewed all phases of PEDP with a focus on the right to equitable access to education for CWDs. Khaton (2016), Naher & Maitles (2020), and Islam (2021) discussed PEDP policy and practice but did not explore PEDP4. So, the literature shows a gap in IE from the lens of the right to equitable education for CWDs in Bangladesh. This study aims to fill that gap, contribute to the body of knowledge, and support future work and policy–especially for PEDP5 in Bangladesh.

Research Methodology

Approaches of the Study

The study has applied both quantitative and qualitative approaches to leverage the strengths of each data type and better understand the research problem.

Data Collection Methods

The study collected both primary and secondary data. The primary data collection methods are Key Informant Interviews (KIIs), Focus Group Discussions (FGDs), and Social Surveys. The study collected secondary data from various relevant, trustworthy, authoritative, and scholarly materials between 2015 and 2025 through a systematic literature search. However, the study consulted some literature published before 2015 to describe the conceptual and theoretical aspects of this thesis.

Sample Size and Sampling Method

Details of sampling methods of the study are shown in the following table:

Table 1: Methods of Primary Data Collection

Sl	Method	Sample Size	Sample Type	Instruments	Stakeholders
1	Focus Group Discussion (FGD)	8	Purposive	FGD Guideline, Observation	Parents, SMC members, teachers, govt. officials
2	KII (Structured Questionnaire)	10 (2 pilot+8 Main)	Purposive	Google Form and Telephone	Academia, Govt. NGO and DP's representatives
3	Social Survey	69	Purposive	Google Form	Govt. NGO and DP officials, parents, teachers

Source: Researcher's Construct

Utmost care and due diligence were exercised so that representations from all types of stakeholders are included in the sample size.

Data Analysis

The study used thematic analysis to process and analyze qualitative data. The process involves coding the data and organizing it into themes or categories. Quantitative data were presented in tables and graphs generated in Google Forms/Docs; no inferential tests were performed.

Validity and Reliability

Careful attention was given to the consistency, reliability, and validity of both primary and secondary data.

Ethical Consideration of the Study

The present study addressed key ethical issues, including informed consent, confidentiality, and anonymity. Collected data were kept confidential, secured, and only used for research purposes.

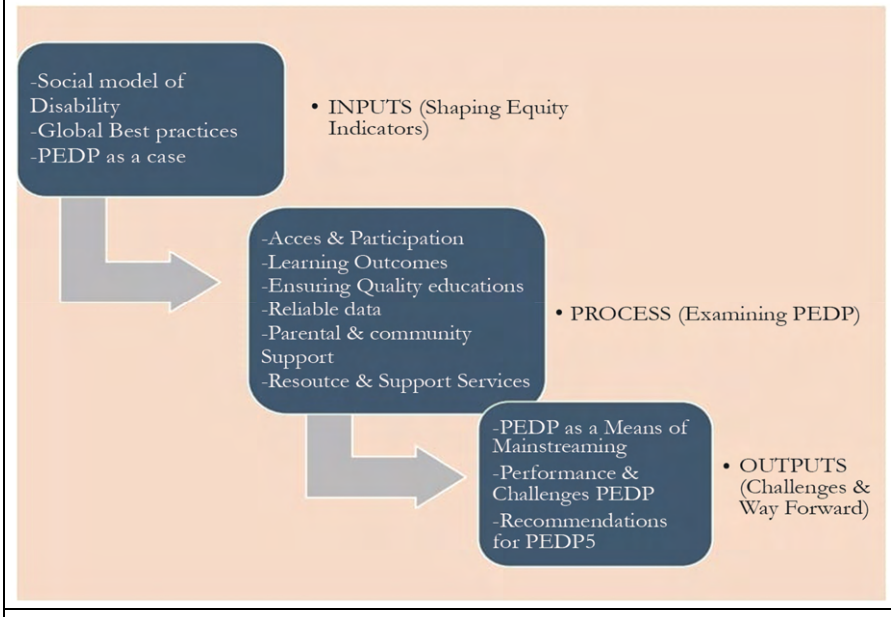
Limitations of Methodology

Methodological limitations included a small and non-representative sample. The study excluded CWDs for ethical reasons. In addition, a five-month time constraint has limited recruitment, pilot, and iterative refinement. Moreover, lengthy interviews (over one hour) led to fatigue, reducing participation and depth.

Analytical Structure of the Study

The following analytical framework, pictured in the figure below, has guided the findings, analyses, and insights of the study:

Figure 1: Analytical Framework of the Study



Source: Researcher's Construct

Findings of the Study

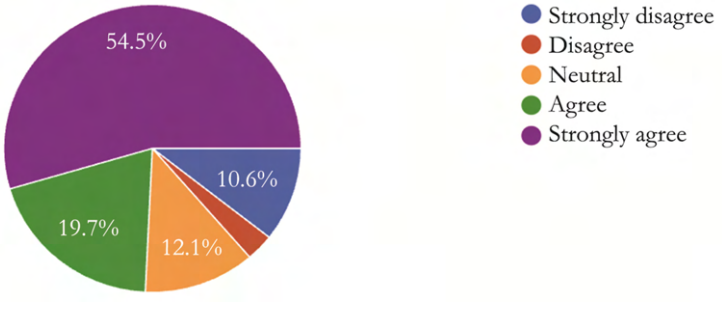
The study explores the PEDP's policy initiatives and assesses their impact on ensuring IE as a means of mainstreaming CWDs into the

primary education sub-system. Respondents in the study have extensive experience with PEDP, as reflected in the survey and KII results. Furthermore, the collected data were compared with existing literature to ensure validity.

Inclusive Education (IE) as a Means of Mainstreaming CWDs

The respondents strongly believe IE benefits both CWDs and non-CWD peers, supporting inclusion as a social equalizer and driver of better learning outcomes. However, its effectiveness varies across contexts.

Figure 2: IE as a Means of Mainstreaming CWDs into Primary Education



Source: The Survey Result Constructed by the Researcher

The survey respondents expressed decisively positive support (74.2% strongly agree and agree) for IE as a key approach to mainstreaming CWDs into primary schools, marking clear acceptance and perceived significance of this concept.

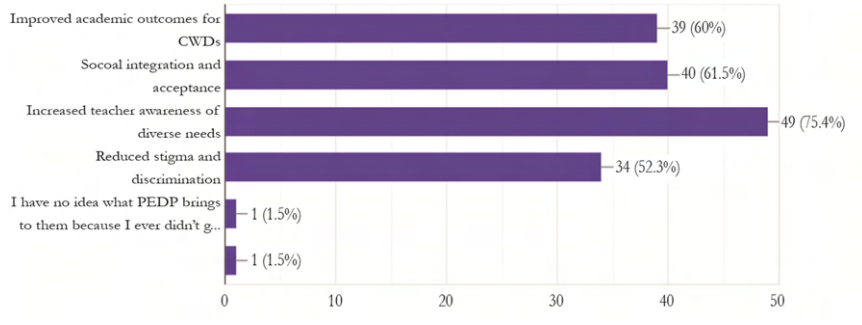
Understanding of Inclusive Education

KIIs expressed a rights-based view, though some equated IE with mere physical placement. FGDs framed it as integration with adaptations. Differences in conceptual clarity align with Ainscow's (2020) argument that inclusive practice requires stakeholders to share a common understanding.

Contribution of PEDP for Mainstreaming CWDs

FGD participants consistently emphasized the academic, social, and emotional advantages of IE. Likewise, KII respondents expressed that PEDP has enhanced policy visibility of IE. Echoing the same tone, survey participants provided the following information:

Figure 3: Contribution of PEDP for Mainstreaming CWDs



Source: The Survey Result Constructed by the Researcher

Most respondents report that the PEDP significantly helps with social inclusion (61.5%). These findings align with UNESCO's (2021) evidence that inclusive environments enhance academic participation, strengthen social acceptance, and reduce stigma.

Civic Engagement

The collected data indicate that parental attitudes toward inclusive education varied; while integration pleased many, concerns remained about severely challenged children. Limited School Management Committee (SMC) involvement and rural outreach may hinder inclusivity, despite positive shifts in awareness and coordination calls. This supports Miles and Singal's (2018) call for strong cross-sector coordination for sustainable mainstreaming.

Barriers to Effective Inclusion

Participants in KIIs, FGDs, and surveys acknowledged barriers to CWD inclusion: limited teacher training, poor infrastructure, lack of aids, and

social stigma–highlighting attitudes as vital as resources for accessibility. This expression reaffirms that attitudes are as crucial as material resources (Hosain, Atkinson & Underwood, 2019).

Policy and Practice Implications

The findings suggest that IE under PEDP has contributed to the social inclusion of CWDs and, in some cases, to academic mainstreaming. However, systemic mainstreaming remains constrained by structural barriers, insufficient resources, inconsistent teacher preparedness, and inadequate cross-sector coordination.

Current Status of the PEDP

PEDP serves as the flagship vehicle at the primary level to achieve EFA (Ahmed & Douse, 2019). The implementation of PEDP follows sequential phases shown below:

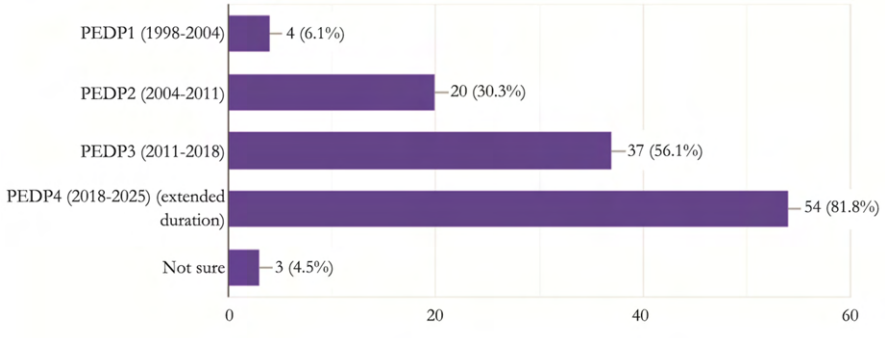
Table 2: Evolution of PEDP Phases and Their Strategic Focus

Phase	Period	Focus	Key Features	Strategic Shifts Towards IE
PEDP I	1997-2003	A Foundational Approach	Built basic infrastructure, improved coordination among DPs	Established the base for sector planning and national ownership of primary education
PEDP II	2004-2022	A Project-Based Approach	Donor-funded projects, quality improvement pilot, early teacher training	Introduced early quality interventions but limited integration for CWDs and equity focus
PEDP III	2011-2018	A Pragmatic Approach	Unified project components into a single national framework; improved management and M&E systems	Promoted system-wide reform and school effectiveness, setting ground for inclusion

PEDP IV	2019-2026	An Inclusive and Equity-Based Approach	Emphasizes equity, inclusion and learning outcomes, integrates IE in all components	Mainstreams children with disabilities, addresses disparities, aligns with SDG 4 (4.1 & 4.5) for inclusive and equitable quality education

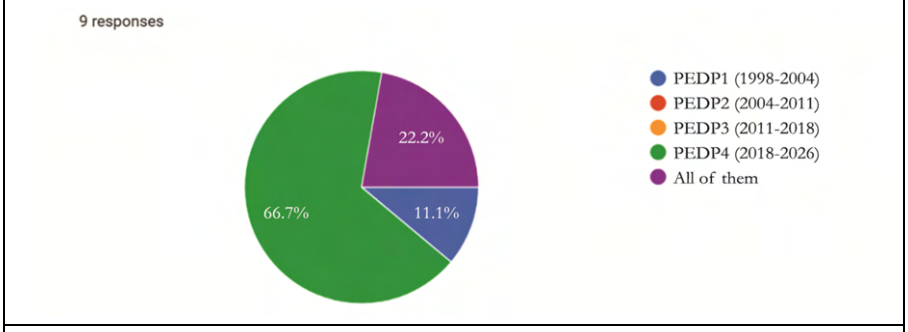
Source: Illustration by Author

Figure 4: The Most Familiar Phase of PEDP



Source: Author's Survey

Figure 5: KII Responses about the Most Familiar Phase of PEDP



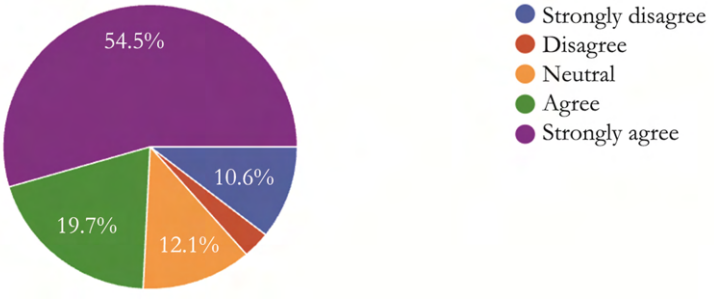
Source: KII Results Conducted by the Researcher

The survey and KII results were similar, with the highest engagement and recognition during PEDP4, with 81.8% of survey respondents and 66.7% of KII participants indicating it as significant. The result demonstrates that effective policy initiatives and awareness of IE have gradually increased across the PEDP phases, peaking in PEDP4.

Performance of PEDP

In line with objective III, this research conducted a survey to evaluate the performance of PEDP. However, FGD and KII also incorporated some questions on this matter.

Figure 6: Significance of PEDP for Mainstreaming CWDs



Source: Researcher's Survey

The results show that a strong majority of survey respondents believe that IE is essential for mainstreaming children with disabilities into primary education. This indicates broad support for the importance of inclusive education among the surveyed group.

Equitable Education Access for CWDs

PEDP plays a vital role in achieving EFA by advancing IE and addressing the needs of marginalized students.

Table 3: Enrolment Achievement by PEDP

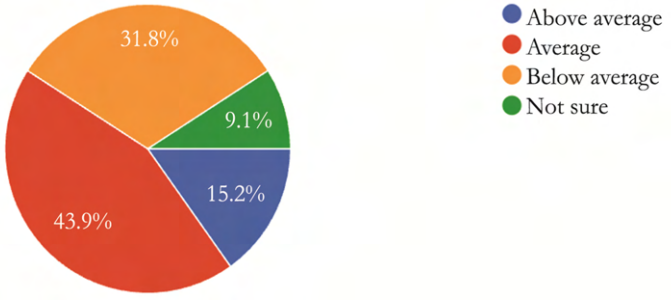
Phase	Period	Enrolment Targets	Achievement
PEDP I	1997-2002	95% by 2000	GER 97%, NER 85%
PEDP II	2004-2011	Sustain gains, expand quality	NER 90.8% (2008) NER 95% (2011)
PEDP III	2011-2018	Improve quality	NER 94% (2009) NER 97.9% (2015)
PEDP IV	2018-2016	Consolidate universal access	NER 97% (2018) GER 110% (2022)

Source: Researcher's Construction (Information from BBS, 2022; BANBASE, 2022)

Enrolment Lag and Dropout Surge

In Bangladesh, primary enrolment has grown, yet NER remains below GER due to low attendance. CWDs, especially girls, face higher dropout rates and limited access in rural areas (Sarker & Unzum, 2023; Khaton, 2016). The APSC (2023 results demonstrate this truth, which is given below (DPE, 2024):

Figure 7: The Academic Achievement of CWDs Compared to Their Peers



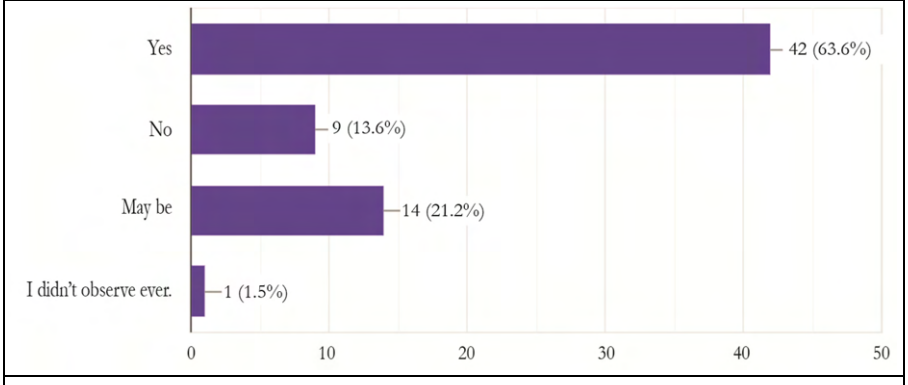
Source: Survey Result

Survey responses show mixed views on CWDs' academic achievement, with most rating it average or below. Prior studies echo this: lower enrolment, higher dropout among girls with disabilities, and persistent completion challenges. The DPE (2024) reports similar patterns.

Equity Gaps Persist within PEDP

Equity remains a great concern for gender and inclusion of marginalized children, particularly for CWDs in Bangladesh (Khaton, 2016). The survey results contain discriminatory information about PEDP4's performance in ensuring equity for CWDs. Most of the respondents rated CWDs' access as good to fair; a few as excellent. The overall findings suggest that equity for CWDs under PEDP4 is moderate and access is comparatively better. However, the quality of teaching support and community awareness needs substantial reinforcement.

Figure 8: Disparities in IE implementation Across Different Regions



Source: Researcher's Survey

The survey indicates that most respondents (63.6%) have observed disparities in inclusive education for children with disabilities between urban and rural/remote areas, highlighting unequal implementation. This suggests that rural and remote regions face greater challenges in ensuring inclusive access to education.

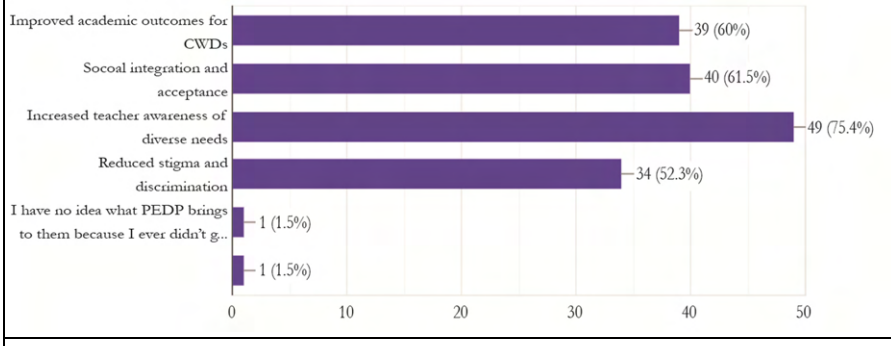
PEDP Shortfalls in Ensuring Quality Education

PEDP introduced supervision to improve classrooms, and NCTB produced structured textbooks and guides. However, many teachers, lacking revised materials or briefings, found the curriculum unfamiliar, increasing CWDs' risk of exclusion.

Insufficiently Explicit Equity Strategies within PEDP

PEDP4 prioritized equitable access for CWDs yet offered few explicit equity strategies. Alongside, MoSW's ESPSDP stipend boosted enrolment. Together, these initiatives improved access, reduced dropouts, and supported completion (Khaton, 2016).

Figure 9: Impact of PEDP Promoting Equity on CWDs



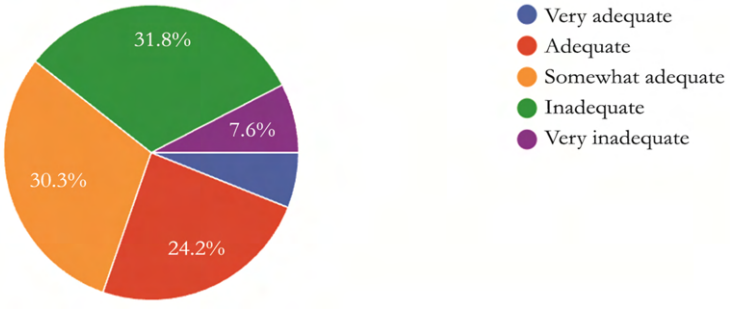
Source: Researcher's Survey

Data show PEDP advances equity for CWDs–awareness: 75.4%, integration: 61.5%, academic gains: 60%, stigma drop: 52.3%. Progress is uneven; Islam (2021) notes visibility is prioritized while academic and social outcomes lag.

The PEDP Fails to Become a Motivational Program for CWDs

Improper and inadequate services are prevalent in PEDP policy initiatives, as expressed in the following survey result:

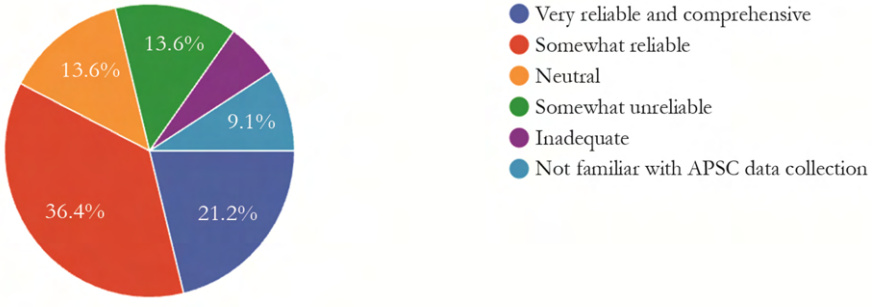
Figure 10: Physical Infrastructure under PEDP4 in Supporting CWDs



Source: Researcher's Survey

About 40% rate infrastructure inadequate (31.8% inadequate; 7.6% very inadequate); 6.1% say it is very adequate; others adequate 24.2%, somewhat adequate 30.3%–signaling shortfalls. Literature notes PEDP's weak rights focus; only Intensive District Approach to Education for All (IDEAL) and Effective Schools through Enhanced Education Management (ESTEEM) show implicit commitment, yet parents/ students wield little influence. CWDs were sidelined from school governance (DPE, 2024).

Figure 11: Reliability and Comprehensiveness of APSC data on CWDs



Source: Researcher's Survey

Most of the respondents (57.6%) find the data on children with disabilities from the Annual Primary School Census (APSC) to be at

least "somewhat reliable," while 22.7% consider it unreliable. This indicates unsatisfactory data quality of the APSC.

The data inclusion has brought moderate but not significant progress – it helps planning to some extent but has not yet led to strong, transformative policy improvement. The collected data show that despite PEDP's progress, major equity gaps remain in access to education, teacher readiness, and resources.

The findings of the study reveal that, while the PEDP has stepped up efforts to promote IE and mainstream CWDs, significant equity gaps persist in access to quality education, teacher preparedness, and resource allocation. Policy-level respondents, through KIIs, highlighted progress in teachers' training frameworks and curriculum adaptation, while acknowledging weak implementation and monitoring at the primary school level. The Social Survey and FGD supported these insights by reporting persistent barriers, including social stigma, inadequate training, and limited assistive materials, which affect CWDs' participation in mainstream education.

Analyses and Insights

Policy-Practice Gap

The key objective of PEDP4 is very clear: to mainstream CWDs into education. Khaton (2016) and Saha & Saha (2024) expressed that equitable access to education is a recognized issue in the policy agenda. However, properly implementing those policies is a great challenge. Sarker & Unzum (2023) identified a clear mapping of problems, roles, and support paths as a missing point. For example, equitable access to mainstream education is one of the main objectives of PEDP4. However, disbursement-linked indicators (DLIs) for the wellbeing of CWDS are absent from PEDP4.

Policy Process Denies Bringing Structural Changes

The top-down policy process in Bangladesh has a traditional outlook that is silent on effecting any change in the structural aspects of the education system (Khaton, 2016). For example, PEDP4 calls for ensuring IE by ignoring social barriers for CWDS. Consequently, contradictions between policy agenda and implementation arise, and desired outcomes remain unachieved.

Contradictory Policy Initiatives among Ministries

PEDP4 calls for equal and equitable access to education for all marginalized groups. However, some policy options deprive CWDs. To illustrate, the stipend programs of the Ministry of Social Welfare (MoSW) and the Ministry of Primary and Mass Education (MoPME) undermine beneficiaries' well-being. The monthly amount of MoSW's stipend exceeds the stipend offered by MoPME. However, receiving one stipend prohibits receiving another. Getting the lower amount earlier makes them ineligible to apply for the better stipend.

Moreover, condition (no. 11.5) of the Ministry of Social Welfare (MoSW) stipend program states that the annual income of the recipient child with a disability must be under BDT 36,000 (US$). In the same way, the allowance for insolvent people with disabilities (Article 10.2) requires that the recipient's annual income be within BDT 24,000 (Hossain, 2015). In addition, the Principles of Agricultural Khash Land Management and Distribution/1997 make poor widows and divorced mothers with a severely disabled child or a daughter with any disability ineligible to get khash land. This policy is directly against the equal rights of disabled children and their families (Khaton, 2016).

Conventional Education System

In Bangladesh, conventional teaching-learning processes, a lack of trained teachers to address CWDs, memory-based lessons, and corporal punishment remain notable challenges to ensuring quality education for

CWDs. Khaton (2016) found that the traditional, fact-based education system hinders CWDs' achievement and lacks an analytical or vocational focus. This brings various negative results for CWDs, such as low achievement rates, poor literacy and numeracy skills, high dropout rates, and high repetition rates (Mujeri, 2010).

Prioritizing Facts Rather Than the Root Cause

PEDP aims to ensure CWDs' participation in IE and addresses the challenges of their limited participation. However, allocating funds to remove barriers to low participation is unsatisfactory (Khaton, 2016). According to Bacci (2009), such a problem representation impedes successful policy implementation. Anderson & Boyle (2015) suggest identifying and better understanding the exclusion and exclusionary practices to eradicate the problem.

More Focused on Quantitative Achievement than Qualitative

Policy initiatives prioritize quantitative goals, such as enrolment and dropout reduction, over qualitative outcomes. Support for CWDs often targets isolated issues rather than systemic reform. Influenced by IDAs, programs like PEDP follow neoliberal agendas, neglecting social context and structural changes needed for inclusive education (Cabello, Sekulova & Schmidt, 2008).To illustrate, PEDP is implemented with financial and advocacy support from various IDAs that encourage the fulfillment of commitments under national and international legal frameworks, respectively, rather than effecting structural change to benefit CWDs.

Inadequate Infrastructural Arrangement

As a vulnerable group, CWDs face various challenges in getting equitable access to both school and the community due to insufficient infrastructural arrangements. This includes standard classrooms, safe drinking water, and sufficient clean toilets. For example, most primary schools have very crowded classrooms, limited learning materials, and fixed seating, which is inconvenient for group work. This type of non-

scientific classroom facility complicates the Multiple Ways of Teaching and Learning (MWTL) process.

Inconsistent Definitions of Disability and IE

Disability is defined in section 3.1.1 of the Bangladesh Persons with Disability Welfare Act/2001 "as a result of such crippledness or mental impairment," which is a formal recognition of society's failure to meet its responsibilities towards PWDs (MoSW, 2001, p. 2). This definition is the shadow of the Medical Model of disability (Khan & Anisuzzaman, 2011), which segregates CWDS from inclusion. Similarly, the absence of a common language for IE is the main barrier to successful IE implementation (Ahsan, 2025). The National Education Policy/2010 itself articulates three types of education - mainstream, integrated, and special education. This is completely contradictory to IE philosophy. Moreover, this policy emphasizes special education for CWDs rather than IE.

Inconsistencies in Disability Data

Disability-related data remain confusing, insufficient, and inconsistent (Ahsan, 2025). There are no clear statistics on the total number of CWDs in the country. DPE (2024) states that the annual primary school census (APSC) covers limited areas of the country. In addition, DPE finds many errors in this data for various reasons, such as the fact that only head teachers provide data and APSC does not focus on disability-related issues. Even the Implementation and Monitoring Division (IMED) does not preserve any data on CWDs. Therefore, the scarcity of disability-related information hinders the development of evidence-based IE policy in Bangladesh.

Recommendations

PEDP will be completed in June 2025, and PEDP5 is in the preparation stage. Therefore, the study provided the following policy and implementation-level recommendations based on respondents' opinions:

Policy-Level Recommendations

- Develop a robust monitoring and evaluation framework to establish an accountable mechanism throughout the primary education sub-sector.
- Allocate dedicated budget lines for IE activities to ensure adequate resources for infrastructure, devices, and capacity building, and to ensure equity for CWDs.
- Enhance effective cross-sectoral coordination among relevant ministries to ensure holistic support for CWDs. Specific responsibilities for MoPME, ERD, IMED, and Planning Commission should be incorporated into the policy instrument.
- Following the SDGs tracker, establish a common platform to share best practices in local and global IE prior to adopting the PEDP5.
- Incorporate Disbursement Linked Indicators (DLIs) with specific focus on CWDs for ensuring their equitable access to education as well as social inclusion.

Operational Recommendations

- The DPE should ensure robust and comprehensive in-service training for teachers on IE practices, specifically to address CWDs.
- Strengthen enforcement mechanisms through conducting regular audits.
- Address infrastructural and logistical challenges CWDs usually face to create a sound educational environment for CWDs.
- DPE and IMED should regularly collect and analyze real data
- APSC and IPEMIS should be expanded nationwide.
- The MoPME and DPE should organize a nationwide awareness campaign that involves relevant stakeholders.
- Establish a research cell at DPE to conduct a study on CWDs' equitable access to education as well as social integration.

Conclusion

PEDP leads the government's efforts to enhance the quality and equitable primary education in Bangladesh. The study aims to assess the PEDP as a means of mainstreaming CWDs into the primary education sub-sector. Using both qualitative and quantitative methods, this study finds that while PEDP has improved enrolment and gender balance in primary education, it has failed to ensure full enrolment, reduce dropout rates, and support school completion for CWDs. The study also observes that girls with disabilities and CWDs from remote areas are more vulnerable than boys and CWDs from urban areas, respectively.

The findings suggest that PEDP has contributed to the social inclusion of CWDs. However, systematic mainstreaming remains constrained. Further, the findings reveal that despite efforts to promote IE and mainstream CWDs, significant equity gaps persist in access to quality education, teacher preparedness, and resource allocation. The research identifies inadequate, conflicting, and inconsistent policy documents; lack of coordination among ministries; ignorance of social context; traditional teaching-learning processes; and scarcity of reliable and adequate data as the main barriers to the proper implementation of equitable access for CWDs in Bangladesh.

The study provides both policy-level and operational-level recommendations to address equitable IE under PEDP5 and beyond. Allocating a dedicated budget, establishing an accountability mechanism for monitoring, setting clear DLIs for CWDs, and improving cross-sectoral coordination are among the policy recommendations. Suggested operational initiatives include robust teacher training, an awareness campaign, stakeholder engagement, and the expansion of routine audits and APSC and IPEMIS to improve data quality.

In the end, IE will only work when it becomes normal classroom practice, not just a policy line. The study findings point to one goal: equitable access, real support, and measurable results for every CWD,

bringing them into mainstream education. Further research is recommended to evaluate the performance of PEDP4 in integrating mainstream CWDs into the primary education sub-system in Bangladesh.

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Security Through Knowledge

LEADERSHIP CHALLENGES IN A MULTI-GENERATIONAL MILITARY ENVIRONMENT AND A PROBABLE WAY FORWARD

Brigadier Jitesh Ralli, ndc

Introduction

The Armed Forces of a nation are the most essential component of its national security. Efficient and effective Armed Forces are an inescapable requirement for any nation. An important dimension that warrants deliberation in today's challenging world is the pace of societal change. Societal norms today are highly dynamic, with new value systems amongst the emerging generation, who are overwhelmingly infused with technology. Generation Next, or the "20-somethings," have literally been born with gadgets in hand. This leads to an additional parental figure amongst this generation, which has a major influence on the value system they imbibe.

Considering the societal changes over the last hundred years, different generations co-exist in our society, and the same is reflected in organizations and the Armed Forces. These generations have stark differences in their value systems and aspects that appeal to their motives. There are primarily five generations evident in our society as follows:

- Traditionalists are people born between 1922 and 1943.
- Baby Boomers were born between 1944 and 1964.
- Generation X is the group born between 1965 and 1979.
- Generation Y, or the Millennials, were born between 1980 and 2000.

Moreover, the latest to enter are the Generation Z or the generation born after 2000, who are now making their presence felt as the latest inductees in organisations.

Amongst these generations in our society, the Traditionalists and most Baby Boomers have now retired. They are not part of the workforce, whereas Generation Y is the primary replacement human capital, with Generation Z also beginning to enter organizations. Considering the hierarchy, experience, and longevity of various generations in an organisation, the roles of people in any organisation as per Henry Mintzberg's organisational model can be classified as under:

- **Strategic Apex**. Baby Boomers and Generation X (age 46 years and above).
- **The Middle Line**. Generation X and Y (age 25 to 60 years).
- **The Operating Core**. Generation Y and Z (age less than 25 years).

As is evident above, Baby Boomers and Generation X are largely responsible for decision-making, planning, and the establishment of structures and processes within any organization. These generations have grown up in a learning environment that employed traditional methodology. Thus, today in any organisation there exists a wide gap between the cognitive abilities of various generations as they co-exist.

Currently, four different generations of officers co-exist within the Armed Forces, and accordingly, these generations constitute the pyramidal hierarchical rank structure. The leadership of the Armed Forces has to be conscious of the coexistence of these generational differences and their impact on the organisation. Leaders must be aware of differences in personality traits and have the competence to understand and interpret them. Leaders need to recognise that the young cohorts joining the Armed Forces are technology-enabled and a boost of social networks that span across cultures, bringing unique competence with them. Generation Next understands technology and social networking better than others; leadership needs to design training that develops critical thinking and analytical abilities to further groom and empower them. Therefore, organisational effectiveness, based on superior technology, leadership competence, decision-making, and evolving war-fighting capability, can be optimized through a better understanding of the coexistence of a multi-generational military environment.

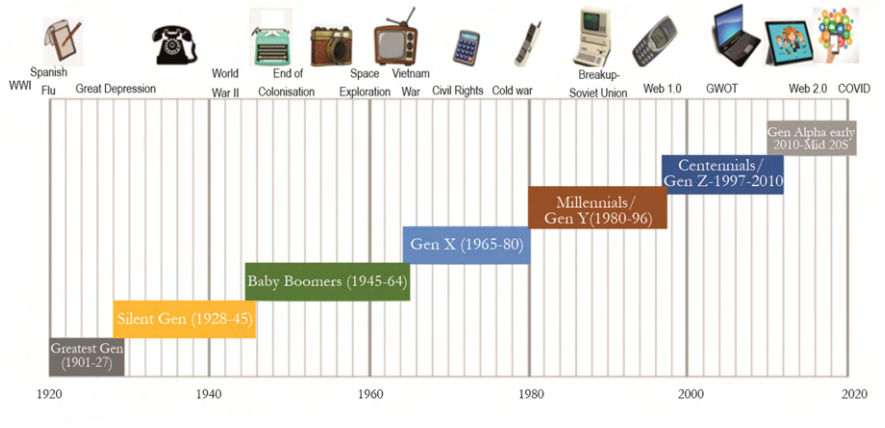
Review of the Literature

Generational theory was propounded by Mannheim in 1952, and since then, many diverse views and theories have evolved. According to Mannheim, people are suggestively inclined and shaped by significant events in their youth, which in turn give rise to generational cohorts based on shared experiences. Over the years, society has seen the emergence of generations that differ from one another and exhibit unique characteristics.

There are few research papers and articles on multi-generation in the Indian subcontinent. (Singh et al. 2011) researched the workplace environment for Millennials in India. To comprehend the lifestyle of urban teenagers, Tata Consultancy Services (TCS, 2014) conducted a survey in 2014-2015. Given the lack of adequate research in the Indian subcontinent context, one important objective of this thesis is to examine the multi-generational military environment.

Classification of Generations. Over time, researchers have defined the 20th-century generations in several ways. Amongst these, perhaps the most cited and seminal work is the Pew Research Papers on "The Hows and Whys of a Generation". The current generations have been defined by a unique mix of factors (Research, 2015). These are represented in the figure below:

Figure 1: Classification of Generations



Source: Pew Research Centre Report, 2019

Role of Technology. While historical events, commonality, or shared identity with a given time period are central to the classification of generations, technology has become increasingly significant in shaping a generation. The dramatic expansion of television changed lifestyles and the way Baby Boomers connected with the world. The computer revolution was central during the growing years of Generation X, while Millennials saw the internet explosion. Consequently, what became unique to Generation Z was the accessibility of all the above since their birth. The technology world also matured and advanced to the next level, with gadgets like the iPhone launched in 2007, and all this happened while Generation Z was still in their teens. Thus, the primary means for Generation Z to connect to the web was through mobile devices, WiFi, and high-bandwidth cellular services, anytime and anywhere. Social media, continuous connectivity, and easily accessible entertainment and communication are technologies that Millennials also adopted during their growing years (Centre, 2019).

Leadership Processes. Leadership theories have been extensively researched in many dimensions. A sufficient number of researchers have indicated that what marks success in any organization is the direct consequence of its members' acceptance of and obligation to various leadership processes. It is natural to expect that as younger generations join the workforce, they bring diverse values and knowledge. Sinha (1995), Singh (1998), and Bhatti (2007) examined leadership ethics, crisis management, and quality leadership, while Gupta (2017) and Blomme et al. (2015) explored adaptive and behavioural aspects.

From the reflections of the literature review, it can be concluded that the available literature is mostly written in foreign contexts but contains significant content on understanding generational multiplicity, leadership theories, and the consequent emerging challenges of the 21st century. However, there is no prior research specifically on leadership challenges in a multi-generational military environment in the Indian Subcontinent. Therefore, there remains scope for further study of the existing multi-generational millennial military environment and the need for modifications to leadership processes, especially given the emergence of Generation Z.

Methodology

The study employed a mixed-method design combining quantitative surveys and qualitative interviews. A structured questionnaire comprising 18 Likert-scale items was distributed to 500 officers across the Armed Forces, with 403 valid responses. Respondents represented Generations X, Y, and Z across the Army, Navy, and Air Force. SPSS was used for data analysis. Reliability testing (Cronbach's $\alpha = 0.857$), KMO (0.842), and Bartlett's Test ($p < 0.05$) confirmed the adequacy of the data. Analysis of Variance (ANOVA) and Chi-square tests were applied to assess relationships between generational characteristics and leadership perceptions. The hypothesis selected for the research was as follows:

"Quintessential Leadership Processes must change in order to exploit the Multi-generational Millennial Military Environment optimally."

Results

Demographic data showed that 47% of respondents were Millennials, 38% were Generation X, and 14% were Generation Z. Core military values such as discipline and service remained universally respected. At the same time, generational variation appeared in decision-making, communication, and feedback preferences. ANOVA results $F(3,399) = 1.666$, $p=0.174$) indicated no significant difference in leadership acceptance among generations, confirming institutional cohesion. However, qualitative responses highlighted younger officers' desire for inclusivity, mentorship, and digital integration. Chi-square analysis revealed that Generation Z officers favoured technological collaboration and rapid information exchange, contrasting with the procedural preferences of senior officers. Chi-square analysis of a survey question and the way inferences have been drawn is appended in succeeding paragraphs:

Item 1: Having Access to the Information through platforms like YouTube, ChatGPT, Social Media, etc to perform your job. Out of 403 responses, 104 (25.8%) respondents feel that having access to YouTube, ChatGPT, and Social Media information is very important/essential.

(Mean= 2.82, SD= 1.102). Further, the Mean of responses across generations and the cumulative Mean of responses from Generation Y and Generation Z on this aspect are tabulated below:

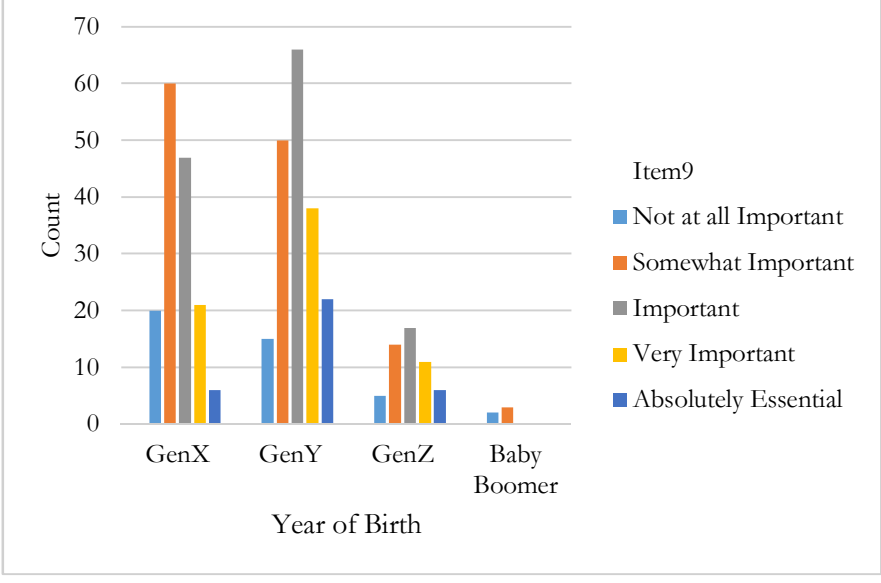
Table 1: Mean of Responses

Generations	Mean	
Baby Boomers	1.6	
Generation X	2.56	
Generation Y	**3.01**	**3.0**
Generation Z	**2.98**	

Source: Researcher's Construct

Responses by Generation. Responses show significantly different attitudes across generations, X^2 (12) = 24.672, p = 0.016 (two-tailed). Thus, it is evident that across various generations, the attitude displayed is homogeneous.

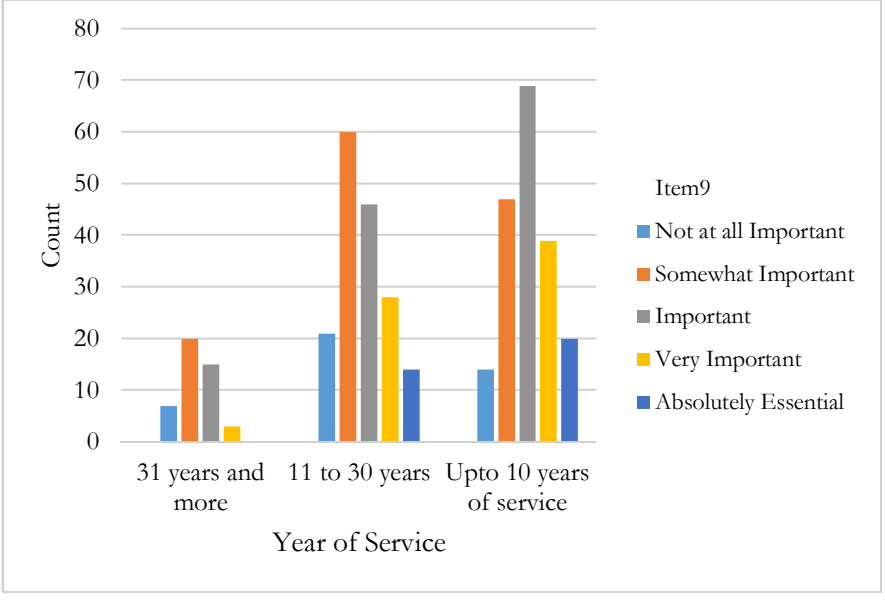
Figure 2: Responses by Generation



Source: Researcher's Construct

Responses by Service. Responses show significantly different attitudes across service groups, $X^2(8) = 20.755$, p = 0.008 (two-tailed). Thus, it is evident that across services, the attitude displayed is homogeneous.

Figure 3: Responses by Service



Source: Researcher's Construct

Discussion

Based on the results and responses, the study's significant inferences are discussed in the following paragraphs.

The study could cover responses from across many geographical areas and had an adequate sample size (n=403) to evaluate serving officers' attitudes towards leadership processes in the current multi-generational military environment in the Armed Forces. The sample population included wide strata of officers with respect to both Service span and Generations.

Endeavour was undertaken to obtain responses from officers of 10 different nationalities. However, due to constraints in the course

curriculum, the nationalities were limited to those of the officers attending the NDC course 2025. The maximum number of responses (289) was received from India, followed by Bangladesh (99); 9 and 2 responses were obtained from Sri Lanka and Nigeria, respectively; and 1 response each was received from Jordan, Mali, Malaysia, Nepal, Kenya and Zambia. Considering the availability of the maximum number of responses from the Indian Sub-Continent, the analysis and inferences reflect this regional perspective. Consequently, a limitation of the survey data is that a Western perspective could not be captured to compare differences in behavioural patterns of Generation Next in the Indian Sub-Continent and the Far West. The same recommendation applies to subsequent studies.

Of the 403 responses used in the study, 83% were from the Army, 4% from the Navy, 10% from the Air Force, and 3% from other sources, including the Civil Services. 47% of the respondents were Officers from Generation Y, followed by 38% from Generation X, 14% from Generation Z, and 1% from Baby Boomers. Endeavour was made to collect sizable responses from officers of Generations X, Y and Z. As Generation X forms the senior hierarchy and Generation Y contributes towards the bulk population in service as on date. Additional effort was made to tap the latest entrants, Generation Z, in the Armed Forces, though only 14% of responses could be collated. While Generation Y represents mid- and lower-level officers, Generation Z is at the starting line of their active service, with most in pre-commissioning training. Responses from Generation Y and Z, and their comparison with those received from Generation X officers, have been the primary focus for drawing inferences and conducting analysis in the study.

One-Way ANOVA. The Null hypothesis, i.e., Quintessential Leadership Processes are adequate to optimally exploit the Multi-generational Millennial Military Environment, as per the One-Way ANOVA carried out, is not rejected, and all means between and within groups are the same. This is a significant finding of the study. According to popular belief, Generation Y and Generation Z are perceived as very different in terms of capabilities due to a tech-savvy environment, early societal exposure, and excessive access to information. However, the One-Way

ANOVA results show that the thought processes of Generation Y and Z across the surveyed aspects are not significantly different from those of their previous generation. Though differences exist, the same will be highlighted in subsequent paragraphs; however, compliance with erstwhile norms and traditions persists among newer cohorts.

Is this an Indian Sub-Continental phenomenon, and would it be at variance with the Western world? This aspect remains to be seen. In the literature review, the peculiarities of Generations and the question of whether the Generational concept, as applicable in the West, should be applied similarly in our region have also been deliberately addressed. The One-Way ANOVA test definitely indicates a significant difference. However, the same can be commented upon with certainty only after a deliberate future study of this aspect.

Chi-Square Test Findings. A chi-square test for homogeneity of responses, both among officers of different generations and among those with different service spans, has been conducted, and the results are shown above. It is evident from the results achieved that the population's attitude towards most aspects of Leadership processes in the Armed Forces is homogeneous across generations and service spans. That is to say, persons from all generations and with different service spans opined similarly when asked about the necessity of benefits (e.g., leave, medical care, pension, etc.) to meet one's personal needs, exercising authority to Command, and employing newer methods of accomplishing tasks. They also expressed similar views on opportunities for career advancement, the ability to listen effectively to different viewpoints, and access to information through platforms such as YouTube, ChatGPT, and social media. Also, aspects such as allowing social interactions and friendships with co-workers and making the work more fun and lively have been similarly noted.

However, the survey shows non-homogeneity amongst responses from officers across different service spans in aspects of work that make a significant impact, challenge one's abilities, and organisationshape the organisational climate that upholds the traditional values and ethos of the Armed Forces. These aspects point more towards the process of

Socialization within the organization. The survey result emphasises the need of ensuring that every new member joining the Armed Forces is subject to an extensive enculturation and deliberate grooming process. However, this process of socialisation amongst the generation next also needs a review, so that the same is naturally aligned with the evolving societal changes of the present multi-generational household and thus finds ease in adoption by the young cohorts.

Considering the inferential statistics results as highlighted above and in order to further analyse the hypothesis the results of descriptive statistics were deliberated upon and the inferences of the same are discussed in the following paragraphs.

Comparison of Means. The means of responses received across generations were deliberately analysed for each of the 18 variables of the survey instrument. Interesting facts have emerged, and they have been captured and tabulated for easy comparison and analysis.

Comparison tables have been formulated to highlight the majority preference amongst responses from officers of different generations. The tables below show the mean responses of various generations for the surveyed variable, with each highlighted. The tables also highlight the cumulative mean of responses of Generation Y and Z when considered together. Highlighted in bold in each table are the maximal values of the means amongst various generations.

Dominant Preferences of Generation Y and Z. It is evident from the tabulated data that Generation Y and Z place greater emphasis on Job Security and associated benefits as part of the job package than older generations. This points towards a more Materialistic Approach amongst the younger generations compared to the previous generation. Another significant aspect that has emerged from the numerical values of the means of responses by Generation Y and Generation Z, when compared with Generation X, points to their social behaviour preferences. These young cohorts place greater importance on social and friendly interactions with their co-workers and want the work to be carried out in a livelier, more fun-filled manner rather than in a stiff, hierarchical environment.

Table 2: Dominant Preferences of Generation Y and Z				
	Baby Boomers	**Generation X**	**Generation Y**	**Generation Z**
Benefits	3.4	3.76	3.82	**3.87**
			3.84	
Job Security	3	3.97	**4.04**	4.02
			4.03	
Social Interactions	2.4	2.95	3.11	**3.15**
			3.13	
Co-Workers	3.8	3.75	3.62	**3.92**
			3.77	
Lively & Fun	3.2	3.71	3.9	**4.11**
			4.0	
Source: Researcher's Construct				

Two more aspects, as responded to by various generations and tabulated below, bring out interesting facts. In line with popular belief, the result shows that, among the younger generation, being born into a world of technology does make them rely on readily available information, including solutions to tasks at hand, through platforms like YouTube, ChatGPT, and AI-based tools. Furthermore, sharing one's thoughts and emotions on social media platforms such as Facebook and Instagram is of immense importance to young cohorts. Also interesting to note is the Risk-Averse nature amongst the younger generations. The results highlight that they would rather employ safer, tried-and-tested processes than explore newer methods with inherent risks, compared with older generations.

Table 3: Responded by Various Generations				
	Baby Boomers	**Generation X**	**Generation Y**	**Generation Z**
Information	1.6	2.56	**3.01**	2.98
			3.0	
Avoid Risk	1.8	2.05	**2.32**	**2.32**
			2.32	
Source: Researcher's Construct				

Dominant Preferences of Generation X. It is clearly evident from the higher mean values of the responses depicted in bold in the table below about the preferences of Generation X over the newer generations. This generation has always wanted their contribution to make a significant impact and wants to exercise positive authority in the work environment. They seek challenges and find opportunities to employ newer methods. They give due importance to a work culture supportive towards effective listening and an organisation climate which upholds the traditional values and ethos of the Armed Forces. This points towards a more old-school approach amongst the greyer generation. As highlighted above in the preferences of Generation Y and Z, the older generation also has a higher propensity for risk-taking, and Generation X is less Risk-Averse than the younger cohorts.

Table 4: Dominant Preferences of Generation X

	Baby Boomers	**Generation X**	**Generation Y**	**Generation Z**
Significant Impact	3.8	**4.25**	3.91	3.92
			3.92	
Authority	3.8	**3.62**	3.42	3.57
			3.5	
Challenges	3.4	**4.07**	3.72	3.89
			3.8	
Effective Listening	4.0	**4.09**	3.87	3.96
			3.92	
Newer Method	3.0	**3.66**	3.51	3.55
			3.53	
Values	4.0	**4.16**	3.92	3.72
			3.82	
Avoid Risk	1.8	2.05	**2.32**	**2.32**
			2.32	

Source: Researcher's Construct

Similar Preferences of Generation X, Y and Z. As discussed earlier and as evidenced by the results of One-Way ANOVA and Chi-Square, the thought processes of Generation Y and Z on various aspects, as surveyed, are not significantly different from those of their previous generation. The same is clearly evident from the means as highlighted in

bold in the table below for Generation X, Y and Z. The aspects listed in the table below show the convergence in the importance people across generations place on them. Thus, both inferential and descriptive statistics indicate that career advancement and awareness of the coexistence of different generations in the Armed Forces are upheld across generations. Also, the flavors of Serving the Nation and making one's Family Proud are held in high esteem across generations.

Table 5: Preferences of Generation X, Y and Z

	Baby Boomers	Generation X	Generation Y	Generation Z
Advancement in Career	3.8	**4.0**	3.94	**4.0**
			3.97	
Different Generations	3.4	**3.56**	3.5	**3.53**
			3.51	
Serve the Nation	3.6	**4.27**	4.16	**4.25**
			4.2	

Source: Researcher's Construct

Interestingly, the top 5 ranking variables indicated by Generation X, Y, and Z in the study survey were compared. The details are highlighted in the table below. Convergence on serving the nation and making one's Family Proud is evident across generations here as well. Generation X showed peculiarity in rating high the aspects of making a significant impact in the organisation, a work culture supportive towards effective listening and an organisation climate which upholds traditional values and ethos of the Armed Forces. Generation Y and Z both prioritised job security and career advancement amongst their top five choices, with Generation Y rating higher on upholding traditional values and ethos, and Generation Z prioritising a lively, fun-filled work environment.

Top 5 Work Value Means

Table 6: Work, Value, Means

Rank	Generation X		Generation Y		Generation Z	
	Value	Mean	Value	Mean	Value	Mean
1	Serve the Nation	4.27	Serve the Nation	4.16	Family Proud	4.34

Rank	Generation X		Generation Y		Generation Z	
	Value	Mean	Value	Mean	Value	Mean
2	Significant Impact	4.25	Family Proud	4.08	Serve the Nation	4.25
3	Family Proud	4.2	Job Security	4.04	Lively & Fun	4.11
4	Values	4.16	Advancement in Career	3.94	Job Security	4.02
5	Effective Listening	4.09	Values	3.92	Advancement in Career	4.0
Source: Researcher's Construct						

An understanding of Generation Y and Generation Z is therefore not only a necessity but an absolute imperative. Having analysed and identified the dominance of the preferences of Generation X, Y and Z individually, as well as the points of convergence amongst these generations, we have mapped, with a high degree of accuracy, the peculiarities these generations bring to the organization. The Armed Forces, being unique in its character as an organisation, is confronted with this multi-generational environment, and all stakeholders have to be conscious of this fact as well as work towards optimally harnessing this diversity for enhancing the efficiency and effectiveness of the organisation.

To effectively achieve the above, let us consider one of the many well-established leadership theories, the Life Cycle Theory, and assess its relevance in today's multi-generational environment of the Armed Forces. Also, efforts are underway to understand how this can be effectively modified to achieve optimal cohesion across generations within the Armed Forces.

To recapitulate the basis of the Life Cycle Theory, it holds that as followers mature, there is a reduction in structure (command and supervision) and an increase in personal consideration (relationships), and eventually even personal consideration can be further reduced. Thus, with a fully enabled and mature group, the leader can reduce both supervision and relationship behavior to negligible levels, as the followers are highly conscious and fully committed to the organisational goals. This theory is also very relevant in the military context.

Application of Life Cycle Theory in Multi-generation Military Environment

Life Cycle Theory lays down four different categories of followers, R1 to R4, with their readiness state in terms of abilities and willingness as under:

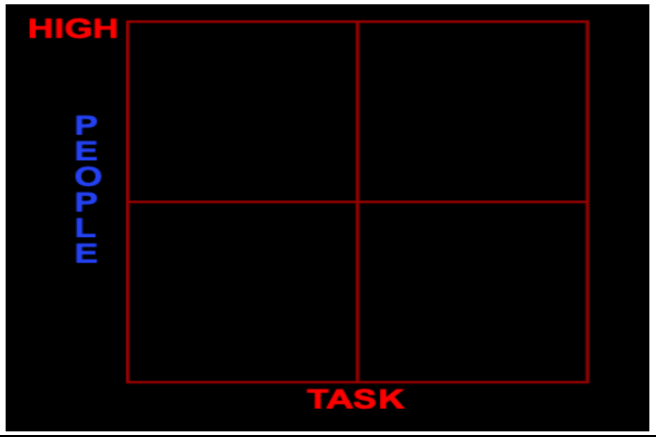
- R1. Unable and Unwilling.
- R2. Unable and Willing.
- R3. Able and Unwilling.
- R4. Able and Willing.

It further lays down four different leadership styles, S1 to S4, commensurate with the readiness states R1 to R4, respectively, of the followers as under:-

- S1. Telling.
- S2. Selling.
- S3. Participating.
- S4. Delegating.

Life Cycle Theory Quadrants

Figure 4: Life Cycle Theory Quadrants



Source: Researcher's Construct

Considering the peculiarities identified for Generation Y and Z followers in the Armed Forces, both the quadrants representing the Telling (S1) and Delegating (S2) leadership styles are likely to shrink. In contrast, the quadrants representing high levels of personal consideration (Quadrants 2 and 3) are likely to bulge. With Generation Y and Z displaying more social behavior and needing more interaction in both virtual and physical workplaces, personal consideration for them is likely to enhance their abilities and willingness to perform within the organization. This major paradigm shift needs to be understood and addressed by the leadership. Thus, senior leaders need to provide support and understanding through more explicit personal interactions.

Practical Contribution of the Study. The practical contribution of this study is that it provides specific indications of officers' perceptions of the importance accorded to various facets of leadership in the Armed Forces. This brings into focus the areas that require greater deliberation to ensure a better person–organization fit.

Theoretical Contribution. This study contributes to the literature, as there are very few research papers in the accessible open domain on the multi-generational military environment, especially regarding officers in the Indian Subcontinent context.

Recommendations and Areas of Further Study

In the current dynamic environment, the Armed Forces, as an organization, desire certain fundamental, unshakable qualities in officers who form the functional backbone for executing both operational and administrative tasks. Generation Y and Generation Z officers will constitute the majority of the Armed Forces workforce over the next decade. Therefore, it is of utmost importance that officers are naturally aligned to the organizational requirements. Towards this end, the following measures are recommended:-

Service Specific Study. Individual services have peculiar service requirements and therefore need to carry forward the study as relevant to their service to devise strategies to channelise and groom the young officers to fit the service's peculiarities.

Socialisation. This aspect of ensuring that every new member joining the armed forces is subject to an extensive enculturation and deliberate grooming process assumes unprecedented importance. Not only the three services but also the stakeholders in the armed forces' recruiting and training hierarchy need to take these aspects into account. Once commissioned, the young officers must continue to undergo rigorous socialisation process peculiar to their arms/services/ships and squadrons.

Time Frame. Given that Generation Z have already begun entering their respective services, it is apt to establish dedicated think tanks to develop strategies for nurturing young officers.

Training Methodology. The foremost requirement today is to make Baby Boomer and Generation X trainers aware of Generation Next trainees' cognitive abilities. Having realised the same, the trainers need to understand and imbibe a collaborative approach**.**

Progressive Approach. After the identified policies/strategies are implemented, there is a need to revisit these measures to assess their effectiveness, implement corrective actions, and realign the strategies in light of the prevailing environment.

Conclusion

A generational change is currently underway within the three services. The new generation has a different personality compared to their predecessors for multiple reasons and experiences. As this generation steps into the Armed Forces, it is essential to understand their expectations, competencies and behavioural patterns in order to optimally harness their talents towards being successful next generation soldiers. The officer cadre of the Armed Forces must be conscious that the Armed Forces are fundamentally unlike any other institution in their organisational fiber and cultural framework, including their values and traditions. To maintain its efficacy and operational efficiency, however, it must identify the drivers of change with caution. A deliberate endeavor to understand these changes in attitude will go a long way towards ensuring organizational effectiveness in the military.

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Author



Brigadier Jitesh Ralli is a second-generation Indian Army officer. He was commissioned into a Mechanised Infantry Regiment in 1996. He has varied experience in Instructional, Staff, and Command appointments, with 29 years of service, and has acquired qualifications including MPhil, MSc, MMS, and Tank Technology. During his service, he has commanded a Mechanised Infantry Battalion and an Armored Brigade in a prestigious strike formation. He has been an instructor in the National Defence Academy, Mechanised Infantry Centre & School and College of Defence Management. He has also served twice in the challenging High Altitude Areas of Ladakh. The officer was part of the initial contingent of the UN Mission in Sudan (UNMIS) in 2006. He has also attended a course at the Naval Postgraduate School, Monterey, USA, on Civil-Military Response to Counterterrorism, and has attended NDC 2025 at Mirpur Cantonment, Dhaka.

THE ROLE OF VOLUNTEER FORCES IN SUSTAINABLE PEACE AND COMMUNITY DEVELOPMENT IN NORTH EAST NIGERIA: CHALLENGES AND OPPORTUNITIES

Colonel Tajudeen Ajibola Lamidi, ndc, fwc, psc (+)

Introduction

Volunteer Forces (VF) are important non-state actors that provide security services at the local or community level, acting in support of formal security agencies, especially in places with weak state/governance presence. While their relevance cannot be overstated, there are concerns about their accountability, legal status, lack of regulation, and potential long-term implications for their formal integration into state security systems and sustainable peace (Volunteers, U.N., 2022; Barford & Gray, 2022).

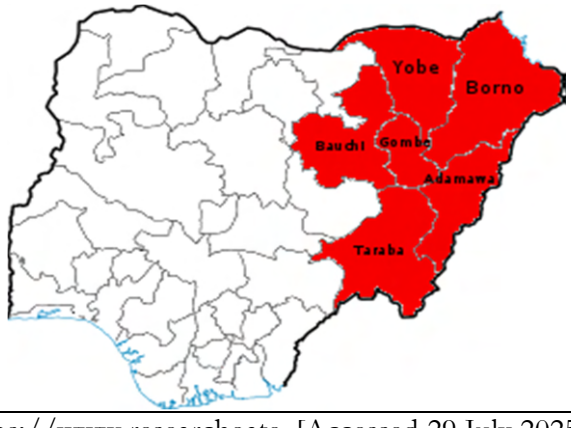
Globally, VFs have served many roles beyond security, including mediation, community sensitization, and assisting with emergencies such as floods, earning them the trust and respect of their communities. In Nigeria, VFs, including the Civilian Joint Task Force (CJTF), various vigilante groups, repentant combatants, and hunters, have become integral to the security landscape, especially in the North East Zone of Nigeria (NEN). Figure 1 is a map of Nigeria showing the NEN. They have assisted the military against criminals and terrorists like the Boko Haram Terrorists (BHTs) and the Islamic State in West Africa Province (ISWAP) through information sharing and the conduct of operations without many limitations over the terrain (Uduo, 2025). Similarly, their efforts and conflict resolution have reduced crime and conflict in rural and urban regions of the country (Anyo & Zumuve, 2020). This improvement is, however, marred by a lack of accountability, the involvement of politicians, and sometimes the use of force, which pose risks to its sustainability and legitimacy (Aslan & Tuncay, 2023). This study examines the roles and challenges

of engaging VF in Nigeria, focusing on the NEN and their potential to promote Sustainable Peace (SP) and Community Development (CD).

Statement of the Problem

Despite VF's valuable contributions to NEN, they face challenges, including the absence of regulatory frameworks and clear operational guidelines. This gap raises questions about their legality, sustainability, and adherence to human rights standards, and creates conflicts with Nigeria's official security institutions (Madryha et al., 2023; Mohammed & Yusuf, 2019). Nigeria's complex security challenges are exacerbated by poverty and economic deprivation, with concerns about the adequacy of traditional military-based solutions (Emina & Ikegbu, 2020). This situation underscores the need to integrate VF into comprehensive development and security policies to provide more sustainable solutions (Attah & Anam, 2021). However, inconsistent recruitment, training, and operational procedures, lack of common operating standards and capacity-building mechanisms, and inadequate psychological support, among others, undermine their effectiveness and legitimacy, which expose them to burnout, manipulation, and exploitation, potentially transforming what could be valuable security assets into sources of instability if not properly addressed.

Figure 1: Map of Nigeria, Showing NEN



Source: https://www.researchgate. [Accessed 29 July 2025]

Research Objectives

Broad Objective

The primary objective of this study is to assess the opportunities and challenges of engaging VFs and their roles in promoting SP and CD in NEN.

Specific Objectives

- To assess the contributions of VFs to CD in Nigeria.
- To evaluate the efficacy of VF collaborations in resolving security challenges and promoting SP in NEN.
- To examine the opportunities and challenges affecting the sustainable integration of VFs into national security and development strategies in NEN.
- To recommend measures to address the challenges hindering sustainable incorporation of VF into national security and development strategies in NEN.

Significance of the Research

This research is relevant in several aspects. The first point of relevance is that the study provides detailed analytical insight into the roles and limitations of VF. A second relevance of this research is that it provides stakeholders, including policymakers, security agencies, and institutions, with realistic, practical information to improve their capacity to address the protracted security crisis in NEN. The third relevance of this study is that it contributes to the enhancement of academic discourse and literature, particularly in the researched area of non-state security actors. As a final point, this study's findings will be useful to strategic stakeholders and advocacy coalitions interested in reforming Nigeria's security architecture, as they can inform prospective scaled-up and community-based interventions that uphold human rights while reassuring community safety.

Review of Literatures

Volunteers can be defined as forces established and organized through the efforts of individuals or communities, with no mandatory obligations, who provide their services, especially in the security and humanitarian sectors (Lavrinenko, 2020). These kinds of groups are usually formed spontaneously to address local neighborhood threats or other mandates issued by the state (Irene, 2023). Some examples of these groups, referred to as non-state armed groups in Nigeria, include the CJTF, Kesh-Kesh, Hunters, Vigilantes, and the Borno Youth Empowerment Scheme (BOYES) (Okokah et al., 2021). Volunteer forces are divided into two broad categories: formal auxiliaries, which are associated with security, and informal groups, which are community-based (Kosi, Timi and Chijindu, 2023).

Understanding the Nexus between Sustainable Peace, Community Development and Volunteer Forces

Sustainable peace is defined as a situation in which there is not just the discontinuation or end of violence, but the creation of intentional systems of governance and additional participatory organisations that preclude the recommencement of violence. (Assefa, 2020). To achieve this, including grassroots people enhances the ownership and sustainability of mechanisms for addressing peace. Peacebuilding and community development enhance each other. Development is essential for reducing the structural drivers of conflict, poverty, marginalization, and inequality, whereas peace is required for development to grow. (Dauda, 2025; Egbe, 2024).

Socio-economic development is associated with sufficient access to local and volunteer security networks, which facilitate greater citizen participation, better local governance, and increased access to services (Attah & Anam, 2021). Galtung (1969) termed this condition "positive peace," which comprises components such as justice, equity, and all-inclusive institutions. Notwithstanding the conceptualization and contextualization, the nexus between VF, SP, and CD is not entirely free of problems and challenges.

The Role of Volunteer Forces in National Security

A critical understanding from the Nigerian viewpoint reveals improved intelligence sharing, rapid response, and community scorecard attributed to the contributions of Volunteer Forces (Ajala & Murphy, 2025; Adzande et al., 2024). Several different organisations including the CJTF, BOYES, hunters have provided support to the Nigerian Army (NA) in several aspects such as in patrols, manning check points dutiess, intelligence collating and securing the rural areas (Onuoha, Tchie and Zabala., 2023).

Within the Nigerian terrain, volunteer forces have improved their service delivery, particularly in intelligence sharing, quick response, and community credibility (Ajala & Murphy, 2025; Adzande et al., 2024). Volunteer force groups have provided significant support to the Nigerian Army (NA), particularly in patrols, checkpoint duties, intelligence gathering, and securing rural regions (Onuoha, Tchie and Zabala, 2023). Ossai and Nweke (2023) found in their study that volunteer groups at the community level have provided swift responses to crime reports, thereby reducing response times and helping build community resilience by inculcating a culture of collective security.

Contributions of Volunteer Forces to Peacebuilding and Community Development

In addition to security enhancement, Volunteer Forces play an important function in activities relevant to humanitarian, reconstruction, and reconciliation by targeting marginalized populations, facilitating psychosocial healing, and building local resilience while enabling rapid crisis response and service delivery, helping supplement services in areas with poor coverage (Razzano & Bernardi, 2024; Ofoma et al., 2024). Furthermore, volunteerism encourages active citizenship, youth empowerment, and social inclusion, with youth-led organizations supporting dialogue and addressing local conflicts, thereby fostering social solidarity and supporting the transition from fragility to stable peace (Anaya Jimenez & Robinson, 2022; Union, 2020).

Opportunities for Sustainable Peace and Community Development through Volunteerism

Volunteer teams are very important in establishing food security because of their contributions to livelihoods and conflict mediation (Ashindorbe et al., 2021). They also provide security cover for agricultural land and activities, thereby stabilizing livelihoods and supporting struggling households in agriculture-related areas. Youth participation in volunteer activities also enables them to develop their locality as active citizens (Oyewo, 2024). Volunteerism could further help meet short-term needs while laying the foundation for long-term recovery by encouraging and enhancing trust, skills, and local capacity, as Chadwick and Fadel (2020) put forward. Community ownership through collective action in the peacebuilding process reinforces stability and reduces the risk of relapse into conflict.

Legal and Policy Frameworks for Volunteer Forces in Nigeria

The Nigerian National Volunteer Service provides regulatory oversight for volunteer activities in Nigeria (Federal Republic of Nigeria, 2020). At the local level, Formal legislation further supports local security efforts, such as the Oyo State Amotekun Corps established by the Oyo State Security Network Agency Law (2020) and the Lagos State Neighborhood Safety Corps Law (2016). In addition, the Benue State policy amended the Community Volunteer Guards to enable the deployment of licensed weapons (Nasiru, J., 2021). Similarly, Borno State established the Youth Vigilante Empowerment Agency Law 2015 (Akaba, Ndukwe and Pius, 2024). Nevertheless, concerns about inconsistencies in the law's implementation across states persist (Rauf, 2021).

Challenges of Volunteer Forces in Nigeria

VF in Nigeria functions with little or no government funding, which negatively affects morale and their sustainability. They suffer from low literacy and language barriers, which hinder their coordination with

formal agencies (Ahmed & Sunamai, 2023). Professionalism and legitimacy are often questionable, especially given the apparent lack of standardized training and a legal operating framework. The capability to integrate activities is also problematic and hindered by a lack of authority and control, non-state integration, and conflict between state and non-state interests and apparatus (Ashindorbe et al., 2021; Agbigboa, 2020). Through proper organization, due recognition, and enforcement, proper policy is needed to address these issues.

Research Gaps Identified

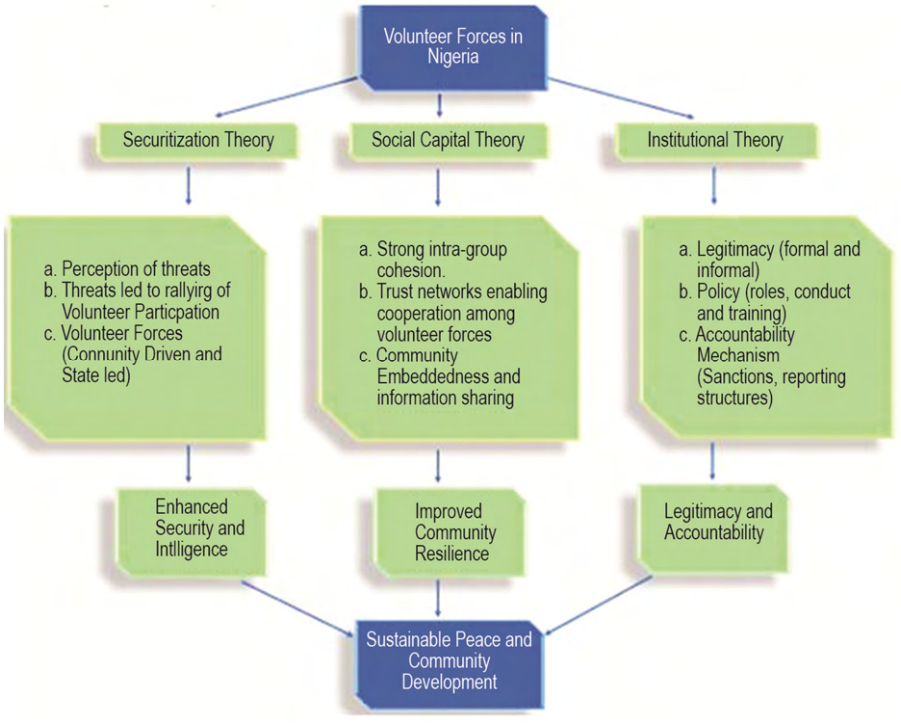
The gaps identified in the literature review include: poor assessments of long-term developmental performance, inadequate analysis of how to integrate VF into national formal/official security systems, and poor evaluation of the functionality of laws and policies in this regard.

Theoretical and Analytical Framework

Securitization Theory (Buzan, Wæver, and de Wilde, 1998) explains that emergency events such as BHTs and ISWAP conflict are classified as existential threats, which warranted their securitization by Nigerian political elites, leading to the formation of VFs such as the CJTF (Gana, 2020). The Social Capital Theory (Putnam, 2000) highlights collective action for the common good through networks of cooperation, with VFs thriving where there is bonding/network (social capital) among ethnic or religious affiliations and bridging the gap between groups in communities. Institutional Theory (Scott, 2013) emphasizes the legitimization of social practices in accordance with formal structures and their norms, noting that VFs in Nigeria lack a clear legal status despite their informal acceptance by the people (Etim & Daramola, 2020). Collectively, these 3 theories demonstrate the formal-informal boundaries of the VF, but this study is hinged on the Social Capital theory.

Analytical Framework. The analytical framework, derived from the 3 selected theories, was developed to guide the analysis towards implementable recommendations for the study.

Figure 2: Analytical Framework



Source: Author's Computation (2025)

Methodology

This study was conducted using a mixed-methods research design that combines qualitative and quantitative approaches and is restricted to Borno State due to the prevalence of insurgency and terrorism there. The sample size for this study, using Cochran's formula, is 228, with respondents selected from communities hit by terrorist and insurgent activities, members of the VF and their leadership, and formal security and law enforcement agencies, using purposive and convenience sampling techniques.

Research Ethics and Limitations

The research adheres to all ethical principles, particularly regarding consent and confidentiality, among other areas. Explicit permission was first obtained before conducting the Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs). Secondary sources were also cited accordingly.

Sources of Data

The primary data for this study were collected firsthand through interviews with VF and individuals directly involved with or affected by its activities. Secondary data were obtained from credible sources, including scholarly articles, books, and publications and reports.

Method of Data Collection

Using a mixed-method design, the study employed both qualitative and quantitative data collection methods. The qualitative part consisted of interviews with carefully selected key informants and FGDs. The quantitative part was a well-defined, structured questionnaire administered to a purposively selected sample comprising civilians, VF, and security agents to obtain statistical data on the perceptions, efficacy, and socio-political effects of VF in Borno State.

Method of Data Analysis

The method used for the analysis of the data obtained comprises both a quantitative approach, including statistical methods, and a qualitative approach, including content and thematic analyses.

Results

Volunteer Forces' Contributions to Security, Peacebuilding and CD in NEN.

Table 1: Contribution of Volunteer Forces to Local Security Operations			
Serial	**Rating**	**Frequency**	**Percentage**
1.	Poor	1	0.44%
2.	Fair	67	29.39%
3.	Good	140	61.40%
4.	Excellent	20	8.77%
Total		**228**	**100.00%**
Source: Survey Study Result 2025			

The data in Table 1 reveal that 61.40% of the respondents view the role of VF as Good, implying that VF are useful partners that complement formal security agencies in performing their roles. Also, 29.39% of respondents view VF's contribution as Fair, suggesting uncertainty or recognition that VF's performance can be improved.

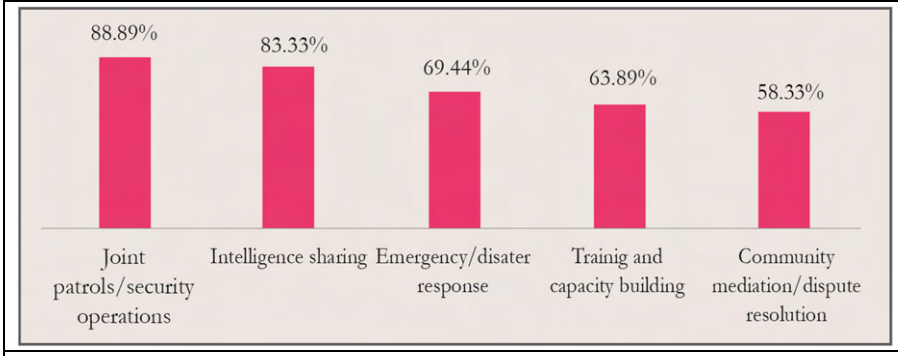
Support to Formal Security Structures and Enhanced Intelligence Sharing

Table 2: Effectiveness of Volunteer Forces in Supporting Formal Security Operations			
Serial	**Rating**	**Frequency**	**Percentage**
1.	Very Ineffective	1	0.44%
2.	Ineffective	8	3.51%
3.	Neutral	30	13.16%
4.	Effective	178	78.07%
5.	Highly Effective	11	4.82%
Total		**228**	**100.00%**
Source: Survey Study Result 2025			

Table 2 shows that 78.07% of respondents considered the VF effective in supporting formal security operations, with 4.82% rating it as highly effective.

Types of Volunteer Forces Collaborations and Initiatives with other Agencies

Figure 3: Types of Volunteer Forces Collaborations and Initiatives with other Agencies



Source: Survey Study Result 2025

Figure 3 demonstrates that the most widespread type of collaboration between the VF and other agencies is Joint Patrols and Security Operations, with 88.89% of respondents involved in such activities. This level of collaboration and cooperation highlights the VF's important role in security.

Perceived Effects of Volunteer Forces on Socio-political Stability

Table 3: The Impact of Volunteer Forces on Socio-political Stability

Serial	Rating	Frequency	Percentage
1.	Low	11	4.82%
2.	Moderate	117	51.32%
3.	High	91	39.91%
4.	Very High	9	3.95%
Total		**228**	**100.00%**

Source: Survey Study Result 2025

Table 3 above shows that 51.32% of respondents assessed the effects of VF on SP as moderate, indicating likely limited effectiveness due to coordination constraints or environmental conditions. Significantly, 43.86%, comprising 39.91% high and 3.95% very high, signifies that almost half of respondents reported that VF has a considerable impact on SP. However, a low rating of 4.82% indicates that few people consider VF inefficient or with a marginal impact on SP.

Humanitarian Support and Community Safety Contributions of Volunteer Forces

Survey data indicates VF plays a significant role in maintaining security and order in Internal Displaced Persons (IDP) camps through vigilance to avoid infiltration by criminal elements and insurgents, and ensuring 'orderliness in the distribution of aid. Performing these dual roles of providing military assistance as well as humanitarian protection facilitates their contributions to peace and CD. VFs also contribute to CD by enhancing livelihood security and providing "security to farmers... giving out tallies to the people going out to farm... it boosts the food security of the place." Additionally, the involvement of VFs in community safety activities, including provision of security for events such as weddings and funerals, demonstrates their embeddedness in local social structure.

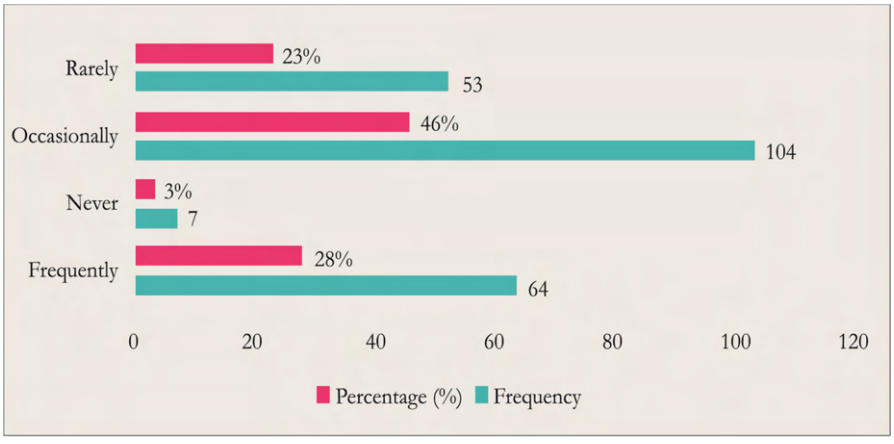
Opportunities for Sustainable Peace and Community Development through Volunteerism

Integration into Formal Security Structure

The VFs operate as auxiliaries to formal security agencies, particularly the police. One respondent clarified the accountability structure as: "They are under the police, even the weapons that are approved for them, which is pump-action... All the equipment goes through the Divisional Police Officer (DPO) …. for accountability." There is partial formal supervision that seeks to control the VF, ensure they operate

within uncontroversial jurisdiction, and provide a mechanism for discipline across the groups. However, the VF lack judicial powers and depend on the police for criminal investigations and law enforcement: "When a crime is committed, they cannot take action but hand over to the police." This distinction makes the role of the VF rather auxiliary to direct law enforcement. Formal security institutions also provide career pathways for VF, enhancing skills and institutional ties: "Some of them joined the army... they were brought back to theatre (NEN) and they are actually carrying out the repair of vehicles."

Figure 4: Frequency of Interaction of Collaboration with VF by the Respondents

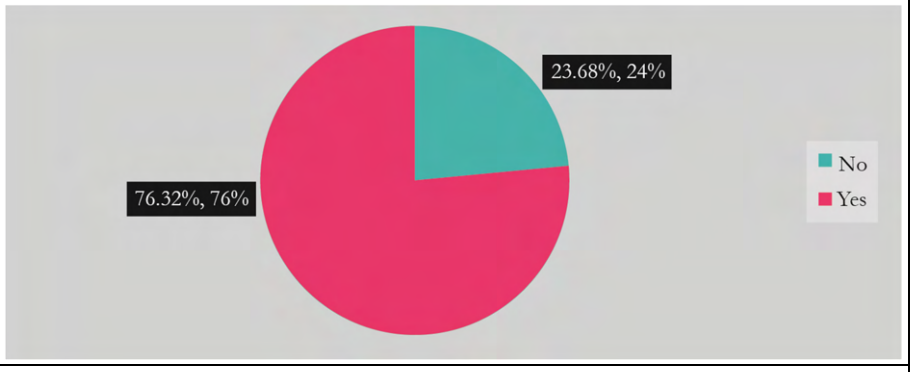


Source: Survey Study Result 2025

From Figure 4 above, 228 respondents were surveyed: 45.61% had occasional interactions, 28.07% had frequent interactions, and 23.25% reported rarely interacting with the VF. Notably, a minor 3.07% 'never interact' with the VF, implying that nearly all respondents experience at least some degree of exposure to the VF, which is vital for inclusive practices and integrated courses of action in conflict-prone or otherwise challenged environments.

Challenges Affecting the Sustainable Integration of Volunteer Forces into National Security and Development Strategies in NEN

Figure 5: Challenges that arise from Agencies' Collaboration with VF



Source: Survey Study Result 2025

Widespread Integration Difficulties. 76.32% of respondents confirmed their agencies experience difficulties working with VFs, indicating persistent structural and operational gaps that hinder effective cooperation between VFs and formal security institutions. In comparison, only 23.68% reported smooth collaboration.

Poor Legal and Policy Structures. There are no Federal laws in Nigeria governing the legality, scope, or mandate of VFs.

High Level of Illiteracy Among VF Members. More than 80% are said to be uneducated, speaking only Kanuri or Hausa and cannot be addressed in English. This leads to a breakdown in communication, with limitations on understanding of security procedures and documentation processes.

Budget and Incentive Constraints. VF grapples with financial support and funding, with attendant implications for the provision of logistics, welfare, and other requirements for an ideal working situation.

Acceptably, some compensation exists, but it is irregular, affecting morale and motivation.

Training and Capacity Building Limitations. One of the most recurring themes in the responses of respondents is the inadequacy of formal training and professional capacity of VF members which affects their integration with official security organisations.

Role of Volunteer Forces in North-East Nigeria

Protection of Lives and Properties in the Community- Local Security

From the results presented in Table 1, 61.40% of the respondents acknowledged the role of VF in securing and protecting lives and property at the local community level as very crucial to them. These findings align with those of Adzande, Meth, and Commins (2024) regarding the relevance of including civilian groups in the national security framework. The qualitative data obtained from the interviews underscored the significant benefits of VF as an effective grassroots security mechanism in NEN against BHTs and ISWAP; this is especially important in situations where the military and police have been overstretched or unable to respond quickly to reported crimes or emergencies. The involvement of the VF in community security and protection efforts aligns with the assertions of Onuoha, Tchie, and Zabala (2023), whose perspective highlighted the CJTF's primary role in combating terrorism. The Securitisation Theory also strengthen this by asserting that in times of severe insecurity and threats, communities usually have no other option but to resort to unconventional responses outside the state's formal security arrangements or framework.

Community Vigilance and Intelligence Gathering

The volunteer forces also play a critical role in vigilance and intelligence collection within their communities. The data disclosed that volunteer informants sourced substantial actionable intelligence in some

operations. This reinforces Razzano and Bernardi (2024), whose work elaborated on the notion that VFs enable speedy crisis response and hence increase resilience among vulnerable groups. The information they obtain is usually passed to the NA or the Police for follow-up action, leading to successful operations, as some military respondents said. Such a role is well supported by Social Capital Theory, which emphasizes the positive level of community trust and the magnitude of interpersonal connections and common values in the formation of positive teamwork.

Support for Formal Security Agencies

The findings reveal that VF acts as everyday support to state security services in planning and executing operations within the state. Notwithstanding, the partnership between the VF and state security has been largely ambiguous due to the lack of clearly defined guidelines, structure, and coordination protocols, which poses a threat to accountability and task delegation. This situation reflects a crucial tenet of Institutional Theory, which holds that informal actors may, through recurring practices, become a de facto institution, even without any legal basis. From a Securitization Theory perspective, the state's tacit endorsement of VF may be informal but indicates acceptance of its own limitations.

Peacebuilding and Mediation Efforts at Local Levels

The VF units in Borno State have expanded the scope of their mandate to integrate non-security-oriented functions into their services. These include providing peacebuilding and conflict resolution support at the community level. The VF are usually regarded as neutral actors and, as such, should be trusted to perform such a role. Respondents in the interview agreed that the VF are usually very prompt in their response towards averting situations that could lead to or escalate into violence. This explanation is in line with the report of Union (2020) on peace promotion. Critical review of this viewpoint a theoretical position shows

that these functions of mediation are underscored by Social Capital Theory, which lay emphasis on the strength of social networks, trust, and reciprocation and also reflects components of Securitization Theory, where there are non-traditional threats, communal tensions are handled and resolved as severe; sufficient to demand special approaches even if these measures fall outside the formal state security apparatus.

Humanitarian Aid and Disaster Management Support

VF's efforts extend to humanitarian response and disaster management. VF has actively supported evacuation operations in several flood-affected communities, maintaining order and security during displacements, safeguarding both lives and property, and participating in crowd control. The Securitisation Theory supports this that heightened perceptions of threats from emergencies like natural disasters, and displacement often require swift, community-led security and response actions especially where formal institutions are overwhelmed or slow to respond. At the same time, Social Capital Theory explains VFs' effectiveness through trust, shared values, and strong local networks that enable efficient collaboration in high-pressure, resource-limited environments.

Contributions of Volunteer Forces to Community Development

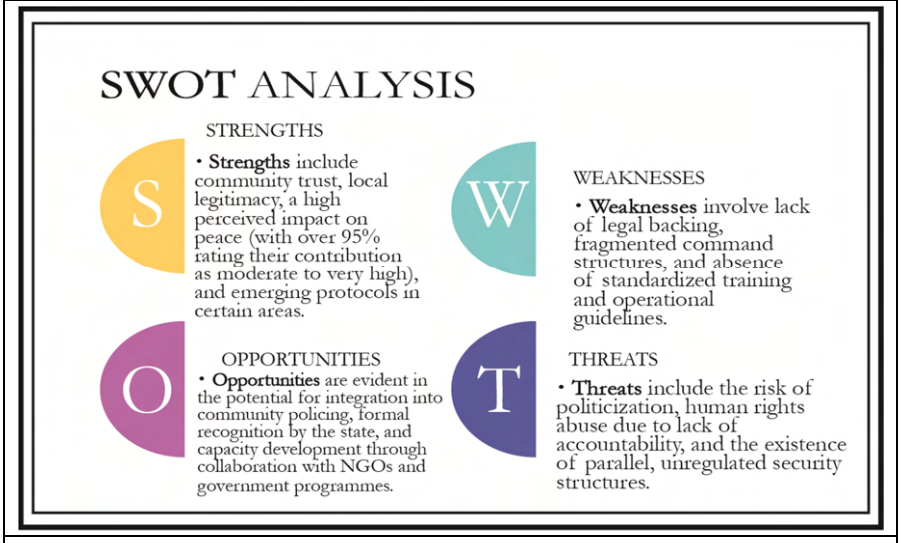
The VF also takes on developmental roles in the transition from post-conflict conditions towards peacebuilding and early-stage development initiatives. VFs protect farmland and escort farmers and traders to markets and agricultural areas, particularly in newly reclaimed areas, thereby contributing to food security. Moreover, the involvement of volunteer forces in development-oriented duty establishes the convergence that exist between security and development goals, as foregrounded in Securitisation Theory. These overlapping mandates reinforce the understanding that peacebuilding and community advancement are inseparable, particularly in areas emerging from protracted conflict.

Policy and Legal Status of the CJTF in Borno State

The CJTF plays a major role in increasing security in Borno State, serving under the BOYES in two divisions: the Borno Youth Vanguard for counterinsurgency and the Neighborhood Watch for intelligence gathering and surveillance. They enjoy close cooperation with the Nigerian military and other state security forces, earning the community's trust and confidence. Although the Borno State CJTF liaises and coordinates with the state actors and is under the Ministry of Justice, its formal legal status is still evolving. For long-term VF integration into the structures of state or national mechanisms, additional clarity can be gained regarding their legal status, accountability options, and official training, among other areas.

SWOT Analysis of Volunteer Forces in North-East Nigeria.

Figure 6: SWOT Analysis of Volunteer Forces in North East Nigeria



Source: Field Data Analysis (2025)

Figure 6 above shows the strengths, weaknesses, opportunities, and threats deduced from the analysis of field data on VF.

Opportunities for Leveraging Volunteer Forces

Effective Security Collaboration with Formal Security Structures

There is a solid foundation for creating a mutual security operating platform for both VF and formal institutions, given the achievements in NEN's counter-terrorism and counterinsurgency operations. These collaborations have shown promise for the growth of regional small security groups and intelligence-sharing systems. Such collaborations could be institutionalised and their coordination improved with the help of a Memoranda of Understanding (MOU) covering topics like community security committees and joint training. This aligns with the Institutional Theory, which highlights opportunities for formalizing informally applied coordination protocols and structure into a system. Additionally, Social Capital Theory highlights the importance of continuing to rely on networks, social connections, and trust to foster collaboration that increases intelligence and trust. According to Securitisation Theory, this partnership acknowledges that the VF has already been constructed and legitimised as the necessary actors in security responses. Therefore, legalising these relationships would strengthen their role within the broader securitised framework of NEN.

Existing Trust and Community Roots

The embedded nature of VF in their communities bestows them with an advantage in implementing peace and security functions, especially as trusted first responders in case of crisis. Formal security agencies could build on this trust by using the VF in community policing, mediation, and civic education. Given that the VF are accorded legitimacy simply because people trust them deeply, this, in turn, facilitates it. This directly follows Social Capital Theory, which argues that social connections and cohesion build trust and the workability of collective action.

Youth Engagement and Empowerment

Young people who primarily wish to contribute to their communities are the primary members of the VF. This is therefore a special opportunity to

include youth development programs in their security training. This further provides opportunity for infusing programmes and initiatives that help prevent violent extremism through state-supported volunteer programmes along with a means of livelihood and social inclusion among the youths e.g. as witnessed in BOYES. Furthermore, viewed through the prism of Securitization Theory, the participation of youth in VF activities and functions signals a conscious societal response to the securitization of insecurity as a monstrosity.

Challenges in the Sustainable Integration of Volunteer Forces in NEN

- Poor Funding and Motivation.
- Inadequate Legal and Policy Recognition.
- Weak Internal Structure and Governance.
- Inadequate Training and Equipment.

Strategies and Mitigation Measures for Integrating Volunteer Forces into National Security and Community Development Efforts

Recognition of Policy and Institutional Mainstreaming

An initial step toward effective integration of VF is the creation of an elaborate legal and policy framework at both the federal and state government levels. To legally define a VF as an auxiliary security partner with precisely defined roles, rights, duties, and limitations, the Federal Government of Nigeria (FGN) could pass the National Volunteer Security Framework Act (NVSFA). Additionally, the NVSFA would give legitimacy to registration, screening, oversight, and cooperation with official agencies. Additionally, uniformity and consistency in the process for establishing and operationalising VF at the state level would result from the FGN's promotion of law harmonisation throughout the states, particularly in NEN. The FGN may also create the National Volunteer

Security Council (NVSC) under the Ministry of Defence or the Ministry of Interior to provide funding and regulatory oversight. State Volunteer Committees (SVCs), comprising members from VF, security agencies, the community, and civil society, could be established at the state level by the State Governments of Nigeria (SGN). State security plans may also involve local volunteer security boards. According to the Institutional Theory, these actions would formalise and legitimise VF's operations, standardising their procedures and improving their consistency, accountability, and sustainability.

Resource Support and Capacity Building

Establishing budget lines for VF funding at the federal and state levels would allow governments to address inadequate funding and motivation by supporting training, insurance, and stipends. A VF training curriculum could incorporate not only the adequacy of operations but also the enhancement of the trust, solidarity, and civic duties in the VF via the incorporation of the Social Capital and Securitisation Theories. To improve cooperative synergy, the SGN might also occasionally arrange joint training for its VF and security agencies.

Enforcing Teamwork Mechanisms and Accountability

The problem of inadequate internal structures and governance would be resolved by enforcing accountability and teamwork mechanisms. Guidelines on how VF should collaborate with the official security apparatus, particularly in areas such as conflict resolution and communication lines, are crucial. Community accountability measures such as regular audits, feedback forums, and grievance redress systems would also be used to check for abuse and lack of transparency. According to the Institutional Theory, standardising collaborative protocols between the groups and state security agencies, and institutionalising informal ties will be facilitated by the development of collaboration mechanisms through the conversion of procedures into codes. To keep VF members accountable and confident, Social Capital

Theory also highlights the significance of trust and community involvement. Furthermore, Securitisation Theory shows that in order to prevent VF from taking matters into their own hands or outside the state as a way to protect legitimacy, accountability in collaboration must be clear. A national framework for accountability, sanctions, and human rights education could be established by the FGN and incorporated into VF training programmes.

Policy and Strategic Recommendations

FGN should:

- Enact a NVSFA to legally define VF as auxiliary security partners with clear roles, rights, duties, and restrictions, and a legal framework for registration and collaboration with formal agencies.
- Promote harmonization of laws across states, particularly in NEN, for consistency.
- Establish a NVSC under the Ministry of Interior or Defence for regulatory oversight, strategic direction, and funding channels.

SGN should:

- Set up an SVC for oversight, accountability, monitoring, and evaluation frameworks for VF.
- Formalize cooperation between the state agencies and VF through MOUs.
- Reinforce internal operating mechanisms of VF to include a constitution and codes of conduct at the state level.
- Set up early-warning and response systems to enhance VF's handling of disputes before they escalate.

Both FGN and SGN should:

- Create budget lines for sustainable funding of VF.
- Collaborate with NGOs and development partners to develop a structured training curriculum to include human rights consciousness among VF members.
- Develop standard operating procedures for VF through co-creation with federal- and state-controlled formal security agencies.

Local Communities and Stakeholders should:

- Ensure their inclusion in the VF structure and decision-making processes.
- Educate members of the public on the potential and mode of interacting with the VF.
- Monitor the activities of the VF, particularly the civil society and NGOs.

Conclusion

In the NEN, VF has emerged as a key player in addressing security concerns and helping local communities advance development. In addition to supporting relief and emergency missions, such as those for floods and the management of internally displaced people, they act as peace brokers in local conflicts. However, they face certain obstacles that compromise their performance, integration, and sustainability. This study makes several contributions to policy, practice, and scholarship regarding the applicability of VF in fragile and conflict-prone states such as NEN. These include the need for formal policy and legal frameworks, the rethinking of security architecture and localized approaches, the strengthening of peacebuilding and mediation capacity, and implications for community development and social capital. The adoption of the

suggested policy change, capacity-building programmes, and accountability measures will help transform the role of the VF into a long-lasting ally in the Nigerian security and development strategy.

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ENHANCING CROSS DOMAIN SYNERGY THROUGH DIGITAL INTEGRATION OF OPERATIONAL FIRE IN THE CONTEXT OF NETWORK CENTRIC WARFARE: A BANGLADESH ARMED FORCES PERSPECTIVE

Lieutenant Colonel Tanvir Ahmed, afwc, psc, G, Artillery

Introduction

The evolution of warfare and technological change have always gone hand in hand. The invention of new technologies over the ages has spearheaded shifts from swords to gunpowder, from trench warfare to air power, and, more recently, from mechanized forces to network-centric operations (Alberts, Garstka, & Stein, 1999). Today, belligerents predominantly aim to determine the war's outcome not merely through numerical or materiel superiority but by unlocking the system of systems and exploiting its weaknesses. Network Centric Warfare (NCW) echoes this shift by linking sensors, shooters, and decision-makers in near real time, enabling them to act faster and with greater precision (Freedman, 2017).

Operational fire plays a crucial role by linking tactical actions with strategic objectives. Unlike tactical fire, which supports in direct contact, operational fire aims to shape campaigns by engaging the enemy's depth, logistics, and communication nodes. History is replete with examples in which sustained, well-coordinated operational fire has significantly altered the course of battles, such as COBRA in Normandy and LINEBACKER in Vietnam (Murray & Millett, 2000). At the same time, these cases also highlight the risks that arise when coordination is weak, interoperability is limited, and command structures remain disconnected, leading to delays and fratricide. Conversely, these operations have also highlighted the risks posed by a lack of seamless coordination and interoperability among the stakeholders involved in delivering operational fires (Clodfelter, 2006).

The Russia-Ukraine conflict is a glaring demonstration of modern operational integration, in which Russia has unified Artillery, missile, air, and electronic assets into a single, data-driven decision loop through Automated Command and Control Systems (ACCS). For Bangladesh, which is in the middle of modernization, these systems provide invaluable lessons (Kofman & Lee, 2022). Over the years, BDAF has procured long-range artillery, precision-guided missiles, and various EW suites. However, most of these assets have been inducted and operationalized in isolation or under the sole auspices of the services. As a result, the synergy of efforts among the services has been overlooked (NATO Strategic Communications Centre of Excellence, 2023).

This study aims to identify a pragmatic approach to digitally integrating operational fire across multiple domains to ensure precise, coordinated delivery with the least possible delay and resource duplication. In the process, it will examine the current state, identify major lacunae, and propose a suitable model for a digitally integrated operational fire structure. The ultimate objective is to enhance cross-domain synergy and prepare BDAF to meet the challenges posed by NCW.

Methodology

Guided by the broad objective of enhancing cross-domain synergy, this research work proposes a viable and effective strategy to digitally integrate operational fire for BDAF in the context of NCW (U.S. Joint Chiefs of Staff, 2022). In support of the broad objective, a few other specific objectives have also been identified. These objectives include examining global practices in the digital integration of operational fire across advanced armed forces; assessing current levels of interoperability, coordination, and precision; identifying key gaps that hinder integration; and recommending a feasible model aligned with BDAF's resources and doctrine. While the primary research question explores how operational fire can be digitally integrated within BDAF to achieve cross-domain synergy in the context of NCW, the secondary

questions address global practices, the present conditions of BDAF, the challenges embedded, and a pragmatic model to emulate.

This study adopts a deductive and explanatory approach based on two hypotheses. The null hypothesis (H0) holds that digital integration of operational fire does not significantly enhance cross-domain synergy. In contrast, the alternative hypothesis (H1) posits that seamless integration enhances cross-domain synergy. These hypotheses provide the basis for statistical testing and frame the analysis of the relationship between digital integration and cross-domain synergy. The research focuses on two variables: digital integration as the independent variable and cross-domain synergy as the dependent variable. These variables are examined through indicators such as coordination efficiency, reduced latency, interoperability, and balanced asset employment across the land, sea, and air domains. As a whole, these indicators form the empirical basis for hypothesis testing (Creswell & Creswell, 2018).

The survey has been conducted on a population of roughly 7000 comprising a fine blend of military officers from three services, students from renowned technical institutes, and academicians. With the population size in view, a 90 percent confidence level, and a 5 percent margin of error, a sample size of 261 respondents has been determined (Survey Monkey, 2025). Thereafter, a non-probability purposive sampling method was used to select the survey respondents. It used a triangulated data collection process, in which data were collected through surveys, Key Informant Interviews (Klls), and Focus Group Discussions (FGDs) to gain a broad-spectrum understanding of perceptions. Both closed- and open-ended questions were circulated to relevant officers of the rank of Major and above across all three services to capture views on interoperability, latency, accuracy, and doctrinal alignment, forming the quantitative basis for the analysis. Leadership from three services, operational-level commanders, and pertinent faculty members from renowned universities were approached for Klls. Three FGDs, comprising officers from three

services, have also been conducted. While the interviews have provided insights into institutional constraints, command culture, and technical challenges, the FGDs have helped the research validate the survey and interview findings.

The authenticity of the analysis has been ensured by using Statistical Package for the Social Sciences (SPSS) and NVivo. SPSS has played a key role in providing analytical insights through descriptive statistics, correlation analysis, and chi-square tests (Pallant, 2020). The results from these tests have shown significant relationships between digital integration and key indicators of cross-domain synergy. With 'p' values lower than the significance level, these tests have confirmed that digital integration, if introduced, will reduce response time, improve coordination, and increase targeting accuracy. Thereby, these tests have statistically rejected the null hypothesis. Having completed the quantitative analysis, NVivo has been used to further confirm the statistical analysis (Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 2018). In doing so, responses from the FGDs and Klls have been grouped and coded by theme. The main themes include communication gaps, doctrinal inconsistency, training limitations, and dependence on technology. NVivo analysis has also revealed frequent use of terms such as "interoperability," "real-time," and "automation." These findings have further substantiated the quantitative results and strengthened consistency throughout the analysis (Bazeley & Jackson, 2019).

Global Context: Digital Integration Practices

This section endeavours to analyze global best practices in the parlance of digital integration of operational fire. In the process, it evaluates key trends, frameworks, and doctrines used by advanced armed forces. The following paragraphs will examine models from the USA, India, and China to highlight key approaches, ideas, strengths and weaknesses, and lessons that are highly relevant to fulfilling the core objectives of the research work.

United State – JADC2

The USA is arguably the global leader in operationalizing digital integration through its Joint All-Domain Command and Control (JADC2) program. JADC2 is not merely a technology upgrade of systems; rather, it reflects a shift toward data-centric warfare (Mills, 2020). It relies on a federated, cloud-based architecture to ensure seamless connection between sensors and weapon systems. Its "State of-the-Art" AI tools process sensor data with near real-time speed and provide operational commanders with a common operational picture. This robust sensor-to-shooter linkage has expedited the decision-making process and significantly shortened the kill chain, giving U.S. forces a clear competitive advantage over others (Mills, 2020).

Under the JADC2 model, systems such as the Advanced Battle Management System (ABMS) and the U.S. Army's Project Convergence have ensured interoperability across multiple services (U.S. Department of Defense, 2022). The aim is to ensure seamless coordination between the sensor and the shooter, irrespective of distance, time, or service. Inputs from Artificial Intelligence and Machine Learning enable predictive targeting and faster response times, reducing decision-making delays.

Despite the above-mentioned overwhelmingly superior technological features, the system has its limitations. Its heavy reliance on cloud and satellite-based communication increases the risk of exposure to cyber threats, data manipulation, and electronic jamming. In addition, because it uses ultra-modern technology, this system is extremely resource-intensive and requires extensive logistics to remain operational round the clock (Clark, 2021).

India-The Expanding C4I Ecosystem

India, focusing on the indigenization and cost-cutting scheme, has adopted a gradual approach to digital integration. It has commissioned a C4I ecosystem built around several service-specific systems. Key examples include Akashteer for Army air defence, Trinetra for the Air Force, and

Command Information and Decision Support System (CIDSS)/ Battlefield Surveillance System (BSS) for the Navy. These systems are capable of linking surveillance, target acquisition, timely delivery, and quick decision-making through secured tactical communication networks (Clark, 2021).

Akashteer integrates India's air-defence assets with the help of a GIS-based command system. It offers near real-time radar displays, automated threat identification and prioritization, and coordination with delivery systems. Trinetra integrates Air Force command nodes by processing intelligence inputs, sustaining the air picture, and providing support for different forms of operations, fusing data from coastal radars and airborne sensors to track surface and subsurface threats. Systems like Combat Management System (CMS) and CIDSS improve situational awareness in the maritime domain. These systems are envisioned to be brought under a unified command structure through the Integrated Theatre Commands initiative by the end of 2032 (Bharat Electronics Limited, 2025).

Despite achieving service-centric progress, India's C41 system suffers from interoperability challenges, Doctrinal differences, service parochialism, and a lack of standardized communication, which limits smooth data sharing across services. Although India is trying to develop indigenous Software Defined Radio systems and secure networks to curb reliance on foreign systems, a full-fledged joint integration is far from reality (Financial Express, 2022).

Lessons are crystal clear from the Indian efforts over the years. Firstly, Bangladesh should aim at gradual modernization through indigenous and cost-effective means. However, the necessity of a joint doctrine and obliteration of service parochialism should not be lost sight of, for technology alone cannot deliver true synergy.

China-IJOCS and Intelligentized Warfare

China has progressed in leaps and bounds through its Integrated Joint Operations Command System (IJOCS). The system heralds a new era

for the People's Liberation Army (PLA), which aims to transform from "Informatized" to "Intelligentized" warfare, in which AI takes the lead role in accelerating decision-making. IJOCS serves as the core digital structure linking space, cyber, and electronic warfare capabilities to the traditional land, sea, and air forces (National Institute for Defense Studies, 2022).

The IJOCS, along with ground sensors and airborne platforms, relies on real-time data from the BeiDou Navigation Satellite System. AI-based algorithms play a crucial role in detecting and assigning targets to the appropriate weapon system. In addition, the system uses 5G-enabled cloud networks to support fast, low-latency data sharing across multiple theatres of operations (Nilchiani, China's Military Transformation, 2022).

The PLA Strategic Support Force plays a pivotal role in sustaining IJOCS. It integrates signal intelligence, cyber defence, and space-based ISR under the same umbrella. The system has taken full advantage of large-scale joint exercises, such as Joint Sword, to enhance training and wargaming realism (Nilchiani, China's Military Transformation, 2022). However, a very sophisticated level of integration and incorporation of state-of-the-art technology does not confer immunity against cyber threats or disruptions through electronic warfare.

Comparative and Thematic Insights

Several lessons common to all the models have emerged from critical analysis. Lessons from the United States and China vividly reveal one fact: technology can deliver results only when it is duly supported by doctrine and faster decision-making. The importance of strong cyber and data security points clearly to the need for a dedicated cyber and data protection structure for BDAF. The growing emphasis on AI-supported predictive engagement is also shaping the future of NCW. Analysis of Indian systems shows that interoperable communication solutions, such as Software-Defined Radios (SDR)-based networks, can improve joint coordination without requiring major infrastructure

investment. Finally, technology alone is not sufficient without human capital. All three countries examined have invested heavily in training specialists in AI, data, and ISR, underscoring the need for BDAF to do the same to remain operationally relevant.

Lessons for BDAF

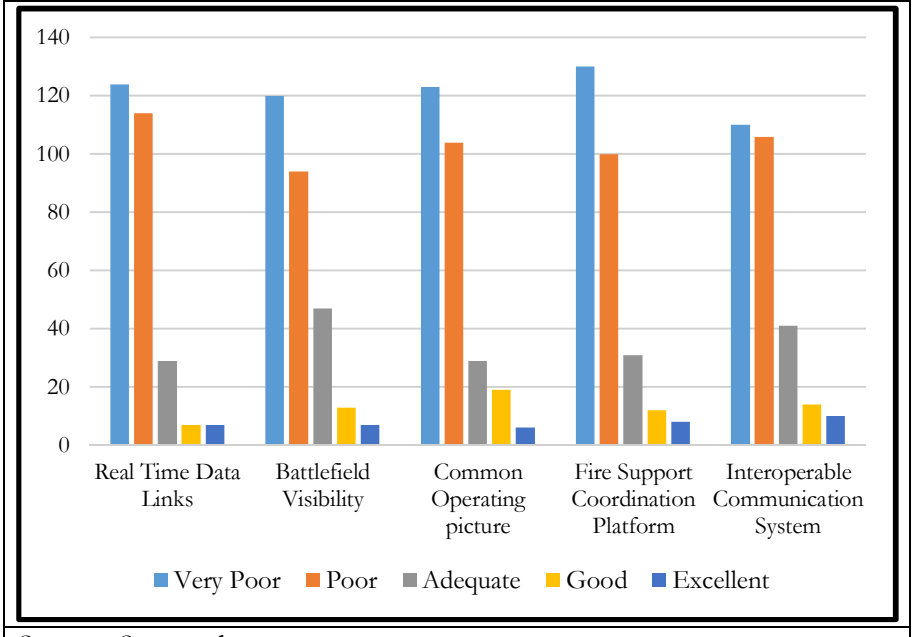
The comparisons drawn above offer several clear lessons for BDAF. Bangladesh should adopt a hybrid approach that combines centralized oversight by a competent authority with operational flexibility vested in the services. This approach will not only enhance resilience but also reduce the risk of being singled out during a crisis. By leveraging a tech-savvy younger generation and making substantial investments in indigenous industry, reliance on foreign vendors should be reduced over a foreseeable period. A joint doctrine accepted and practiced by all three services is a sine qua non. The modernization scheme should commence in stages, starting with an SDR across the services, a shared ISR, and a command backbone, and then expanding to real-time targeting and fire coordination. Drawing lessons from China's practice of integrating civilian expertise with military capabilities, BDAF should actively engage the country's tech-savvy youth and incorporate their skills into operational planning and battle design. Experience with global models shows that effective digital integration depends not only on hardware but also on organizational structure, institutional culture, and doctrine. The success of BDAF will therefore depend on achieving interoperability across procurement, training, and command philosophy to integrate operational fire and enhance cross-domain synergy digitally.

Current State and Key Caveats in BDAF

Findings from the survey, KIIs, and FGDs indicate that BDAF has made notable progress over the years. However, the long-standing organizational structure across the services still lacks the level of digital integration required for true cross-domain synergy. Each service has

developed strong capabilities based on its operational needs. The Bangladesh Army fields long-range Multiple Launch Rocket System (MLRS) for deep strike missions, the Bangladesh Navy operates long-range surface-to-surface missiles, and the Bangladesh Air Force employs precision-guided munitions and modern strike aircraft. Despite these capabilities, they largely operate in isolation due to the lack of a unified digital command-and-control system. As a result, the expected combined effect of joint operational employment of fire assets remains unrealized.

Figure 1: Key Challenges



Source: Survey data

Interoperability

Interoperability remains one of the weakest cogs in BDAF's current digital architecture. While only 28 percent of respondents believe inter-service coordination is effective, most point to incompatible communication systems as the lacuna. The Army, Navy, and Air Force operate through separate networks using different frequencies,

encryption standards, and data formats. (Uddin, 2025) This has created isolated digital systems in which information sharing across services is cumbersome. Each service collects and processes intelligence separately, without any automated system for real-time data exchange. As a result, coordination relies heavily on manual inputs and voice communication, which ultimately decelerates the kill chain. The absence of a Joint Tactical Data Link has emerged as a major limitation following the FGDs (Officers, 2025).

Timeliness and Command Latency

Quantitative analysis has revealed a strong link between command delay and reduced cross-domain synergy. The presence of multiple decision layers and parallel command chains slows the overall operational fire response. In practice, a detected target must pass through several headquarters for approval, a time-consuming, energy-sapping process that increases the risk of duplication and error. Respondents further noted that BDAF continues to operate in a semi-centralized command environment, in which tactical commanders have limited authority to engage targets, even when targets are identified early. The absence of automated sensor-to-shooter loops adds to this delay, despite the availability of capable systems. FGDs have also highlighted that manual target validation, while doctrinally sound, is too slow for the demands of modern operations. Overall, although the technical means are available, existing command and procedural structures prevent their optimal use (Nazim-ud-Daula, 2025).

Fire Allocation and Asset Apportionment

The allocation of delivery means and the apportionment of assets in BDAF are still primarily based on pre-planned target data developed during peacetime exercises. While these target data provide an initial basis, making necessary adjustments in a rapidly changing operational environment becomes very difficult. As a result, fire guidance, asset apportionment, and necessary modification of the fire plan fail to adapt

to real-time developments on the battlefield. Insights from Hossain (2025) on kills of officers from the Bangladesh (BD) Army and Navy show that target engagement orders issued through separate service-specific command channels frequently lead to duplication of effort or inefficient use of available assets. Much to the dismay of planners, naval and air assets are often found locked against the same target area without coordination, resulting in wasted resources and increased risk of fratricide.

Situational Awareness

Accurate understanding of the battlespace is indispensable for effective operational fire. ISR assets such as surveillance drones, maritime patrol radars, and reconnaissance aircraft are operated under the aegis of each service. This results in fragmented operational pictures rather than a unified view of the battlespace. Survey findings further substantiate that field operators rarely access real-time ISR data from other services. KIIs indicate that software mismatch and limited bandwidth are the key barriers to effective real-time data sharing. In addition, the absence of a unified geospatial platform and formal cross-domain data-sharing arrangements impedes situational awareness. These limitations not only delay engagement decisions but also reduce planning accuracy and increase risk during joint operations (Islam, 2025).

Organizational Barriers

Organizational and doctrinal factors remain impediments to digital integration. While each service has developed internal doctrines and standing operating procedures for fire coordination, there is no tri-service doctrine defining joint targeting responsibilities, data ownership, or command hierarchy in digital operations. Interviews with senior staff officers revealed a persistent "service-centric mindset" that resists pooling of assets under joint control. Consequently, the coordination of operational fires often depends on informal arrangements rather than institutionalized frameworks. Training deficiencies further compound the problem (Razzak, 2025). Exposure to digital command systems and

advanced Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) platforms remains largely limited to technical cadres, leaving many operational commanders with an incomplete understanding of how to exploit networked tools.

Cybersecurity and Infrastructure Limitations

As reliance on digital systems increases, so does the need for cybersecurity for BDAF. There is no denying the fact that the risk of cyberattacks, data manipulation, and electronic jamming will rise without strong protective measures. Although some communication systems currently use commercial encryption, they do not provide adequate military-grade security (Uddin, Key informant interview on cybersecurity and communication resilience, 2025). While the absence of a joint Cyber Defence Unit has further compounded the whole issue, there is lack of redundancy in Satellite communication system, fiber-optic connectivity, power and server backup arrangements. As a result, although BADF possesses modern hardware, its supporting digital infrastructure remains fragile and susceptible to disruption.

Synthesis of Findings

The combined analysis of surveys, Key Informant Interviews (KIIs), and FGDs clearly shows that BDAFs progress toward digitally integrated operational fire is still in its nascent stage. Despite having professional personnel and an active modernization program, BDAF continues to face challenges including a fragmented command structure, limited interoperability, and weak cyber resilience. The absence of a unified doctrine and reliable digital infrastructure prevents the force from operating as an integrated entity capable of meeting the speed and accuracy demands of NCW. The study therefore finds that institutional reform, supported by a joint doctrine, digital systems, and a phased integration roadmap, is essential for aligning communications, integrating Intelligence, Surveillance, and Reconnaissance (ISR) assets, building technical skills, and achieving effective cross-domain synergy.

Feasible Options and Proposed Model for BDAF

Digital integration of operational fire in BDAF must be rooted in sound doctrine, realistic technology, and organizational adaptability. Any workable framework should connect the three services' command-and-control systems and allow data, intelligence, and targeting information to flow in real time. Experience from JADC2 in the USA, India's C4I initiatives, and China's IJOCS shows that effective integration requires a secure, interoperable, and flexible digital ecosystem. Considering Bangladesh's fiscal constraints and its phased modernization, a hybrid and federated model appears most pragmatic.

Guiding Principles

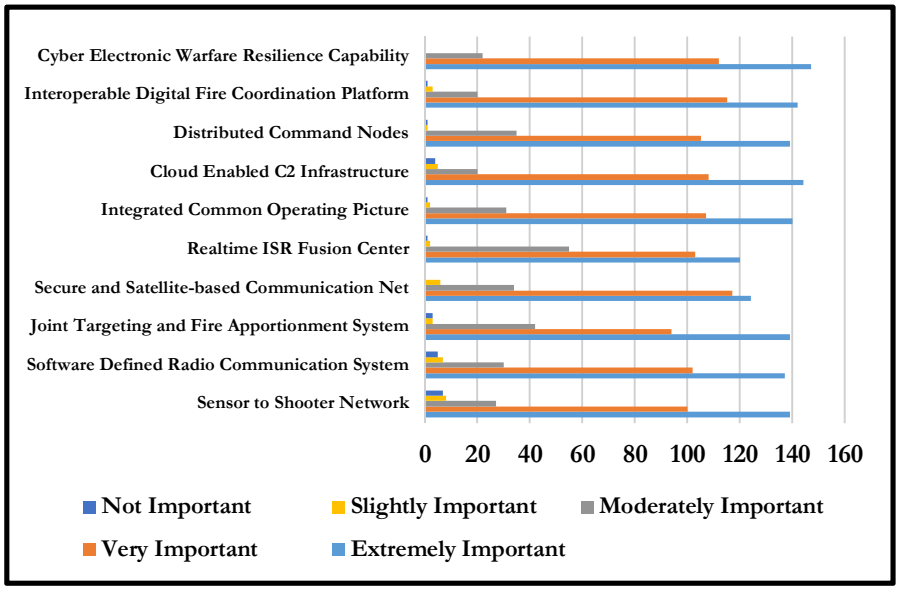
The proposed system for digital integration of operational fire in BDAF must rest on four guiding principles: doctrinal alignment, interoperability, security, and sustainability. The system should align with the principles of NCW and the Joint Warfare Doctrine so that commanders at different levels can use shared information to coordinate fire across domains. Interoperability is equally critical and requires common communication standards, compatible encryption, and shared data formats that link command networks with intelligence databases, surveillance assets, and fire coordination systems. As connectivity expands, cybersecurity must underpin the entire architecture through layered protection, redundancy, and reliable backup links to counter jamming, cyber intrusion, and data loss. Establishing a joint cyber and data security unit, Armed Forces Division (AFD), would strengthen oversight of information assurance.

Proposed Model

The proposed Digital Integration Model is designed to support, sustain, and coordinate operational fire across the Bangladesh Armed Forces. Its main purpose is to enable fast and accurate coordination of information, decisions, and fire missions among the Army, Navy, and Air Force. The model is built around five connected components, each with a distinct operational role. At the top, a joint operational fire coordination cell will

be established under the aegis of the Armed Forces Division to serve as the central hub for joint fire coordination and intelligence integration. Staffed by representatives from all three services, the cell will oversee approval of joint fire plans, maintain a common target list, and coordinate joint intelligence preparation of the operational environment. Each service headquarters will be supported by upgraded command-and-control nodes that receive real-time inputs from sensors, intelligence sources, and operational units. Decision support tools will assist commanders in comparing targets, available fire assets, and mission priorities, enabling quicker and better-informed decisions. A joint targeting and fire apportionment system will link these nodes and assign the most suitable fire asset based on distance, capability, and urgency while also recording strike results for future planning. A real-time ISR fusion center will integrate data from drones, radars, satellites, and maritime patrol aircraft to produce a shared operational picture accessible to all services. Last but not least, all these components will be connected through a secure digital communication backbone.

Figure 2: Key Components



Source: Survey data

Recommendations

Short-Term Recommendations (0-2 Years). In the short term, procurement through Directorate General Defence Purchase (DGDP) should institutionalize integrated procurement mechanisms that prioritize lifecycle sustainability and cross-domain and inter-service compatibility, in line with joint doctrine. This will help ensure that acquisition decisions support long-term modernization goals. At the same time, a Tri-Service Joint Fire Doctrine on digitally integrated operational fire should be postulated and endorsed by the AFD to provide doctrinal clarity.

Mid-Term Recommendations (3-5 Years). In the midterm, C-band and Ku-band V-Sat Terminals, along with interoperable SDRs, should be deployed across services to enable real-time, encrypted communication. In addition, a joint ISR Fusion Centre should be established to integrate multi-sensor data from the Army, Navy, and Air Force.

Long-Term Recommendations (6-10 Years). In the long term, a cloud-based, AI-supported command-and-control infrastructure should be deployed across all services to improve targeting speed and reduce the risk of fratricide. In addition, a pilot Joint Fire Coordination Cell should be established at a selected command level to test interoperability, communication protocols, and digital fire coordination through simulations and SDRs.

Conclusion

Insights from the global models clearly demonstrate that digital integration of operational fire relies on joint doctrine, seamless interoperability, a secure data network, and AI-based decision-making. USA's JADC2, India's C4I ecosystem, and China's IJOCS have established one glaring fact: desired results are delivered only when technology and platforms are duly supported by a set of trained personnel, strong cyber defence, and a neatly connected command

structure. These findings once again underscore the need for digital integration across the entire operational fire ecosystem to enhance cross-domain synergy.

Results from surveys and perceptions generated through KIIs and FGDs reveal that BDAF has made notable progress in developing service-centric operational fire assets. However, the lack of a unified digital command-and-coordination system is the key caveat to achieving effective cross-domain synergy. Interoperability, being the bedrock of cross-domain synergy, is significantly weak due to the lack of joint tactical data links and incompatible radio communication systems across the services. Much to the dismay of operational-level planners, multiple decision layers and manual sensor-to-shooter links further delay the overall process and slow down the kill chain.

Digital integration of operational fire in BDAF should be based on sound doctrine, home-grown technology, and organizational adaptability. With technological requirements, budgetary constraints, and force modernization in mind, a model spanning a 10-year implementation window is most feasible. The proposed model should centre around a Joint Operational Fire Coordination Cell under the AFD, which will coordinate, monitor, delegate, and ensure timely and accurate operational fire without the duplication of effort.

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INSTITUTIONALISING JOINT WARFARE STUDIES IN THE BANGLADESH ARMED FORCES: NEEDS ASSESSMENT AND FRAMEWORK DEVELOPMENT

Lieutenant Colonel Md Wadud Ullah Chowdhury, afwc, psc, Infantry

Introduction

The contemporary security landscape necessitates a highly coordinated military structure that integrates land, sea, and air forces to ensure strategic and operational effectiveness. Joint warfare has emerged as an essential concept for achieving effectiveness in complex and evolving threats. The Bangladesh Armed Forces (BDAF) do not not have a structured Unified Think Tank or Joint Warfare Study Centre (JWSC), unlike advanced militaries in other countries that have institutionalised joint warfare doctrines (Rasheduzzaman, 2025). This deficiency impedes interoperability among services and restricts BDAF's ability to operate as a unified force in both peacetime and wartime. The absence of such a centre results in an operational gap, ineffective resource allocation, and a split approach to unified military planning. (Rahman, 2021). However, the concept of jointness emphasizes the interoperability of services (Bhuiyan, 2025).

BDAF frequently works in isolation, lacking coordinated interoperability, effective intelligence sharing, and integrated doctrinal frameworks (Muniruzzaman, 2025). Several countries and global actors have made substantial progress in joint operational frameworks, fostering joint planning, training, and capacity building. Bangladesh's geopolitical location, security threats, and military transformation efforts underscore the necessity for a well-thought-out, structured, and

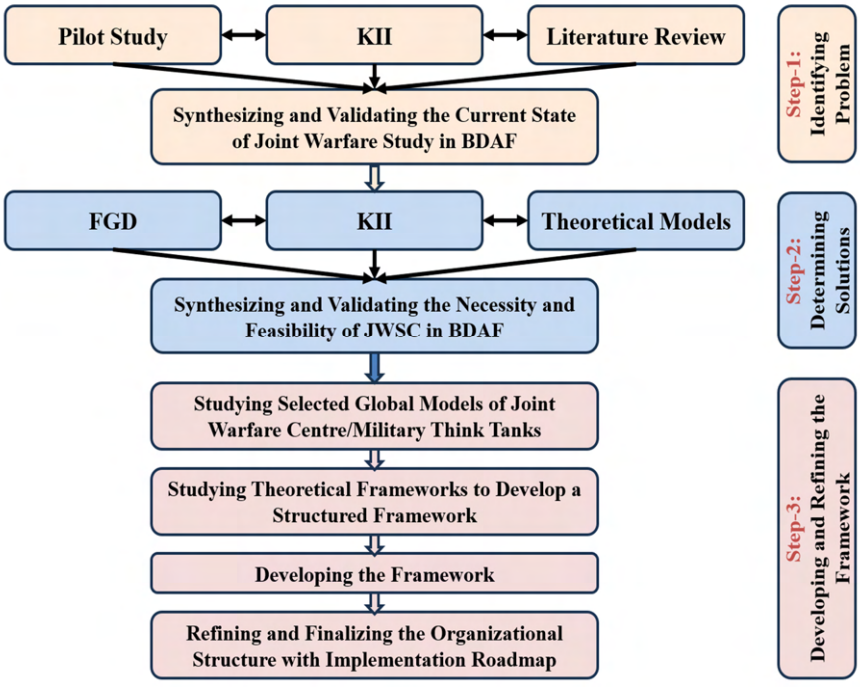
dedicated joint warfare study effort to enhance policy research, tri-service strategy formulation, joint operational planning, and force integration. Executing such an effort would allow methodical study of joint operations, foster strategic innovation, and enhance defence capabilities (Ahmed, 2021).

The absence of a structured JWSC intensifies the aforementioned challenges. Though the Bangladesh Army, Navy, and Air Force are developing their respective services' training and doctrine, there is no apex body to provide policy input for joint doctrine development, tri-service integration, or effective, synchronized training. This research aims to assess the necessity of institutionalising joint warfare studies within the BDAF, identify structural gaps, and propose a framework for establishing a JWSC.

Research Methodology

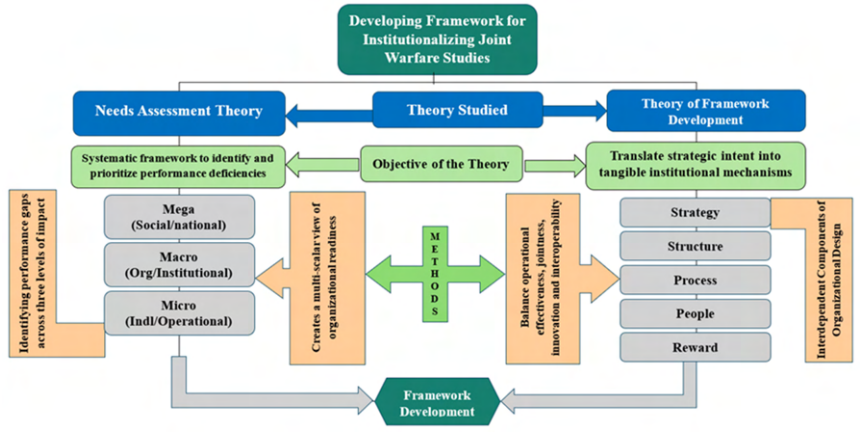
The main objective of the research is to assess the necessity of institutionalising Joint Warfare Studies in the Bangladesh Armed Forces and to propose a structured framework for its implementation. This study used a mixed-methods approach, combining qualitative and quantitative techniques. First, the study reviews available military reports, academic literature, and open-source materials to form an academic base. After that, the study gathers primary data collected through expert interviews, case analyses, and surveys. Collected data are analysed using NVivo, SPSS, Microsoft Excel and One-Way ANOVA to identify the patterns. The study employs methodological triangulation, combining key informant interviews (KIIs), focus group discussions (FGDs), surveys, and content reviews. This approach improves accuracy, reduces bias, and assists in a balanced interpretation.

Figure 1: Analytical Framework



Source: Researcher's Self-Construct

Figure 2: Customized Theoretical Framework



Source: Researcher's Self-Construct

Current State of Joint Warfare Study in Bangladesh

Overview of Military Think Tanks on Joint Warfare Study

Despite significant progress in professional military education and modernization, there is still no institutionalized framework dedicated solely to the study of joint warfare across the BDAF's tri-services. While institutions such as the National Defence College (NDC) and the Defence Service Command & Staff College (DSCSC) expose officers to joint concepts, these are not reinforced by a sustained research and development framework focused on tri-service integration (FGD-1). This creates a critical gap in capacity development, joint force projection, and crisis response planning for Bangladesh.

Bangladesh Army

The Bangladesh Army does not yet have a dedicated think tank or research center at the Army level. However, the Osmani Center for Peace and Security Studies (OCPASS) is being funded by Army Headquarters to be established as a strategic and military-strategic-level think tank (Rahman, 2025). Apart from this, Army Training and Doctrine Command (ARTDOC) conducts a few training-related research projects within the Army on a limited scale.

ARTDOC. ARTDOC is a research-oriented formation in the Bangladesh Army. It is responsible for overseeing training evaluation and reforms; weapons, equipment, and force modernization; and development of concepts and doctrine revision. However, it does not address joint warfare or jointness in integrating the three services (Kabir, 2025).

OCPASS. OCPASS is a think tank affiliated with the Bangladesh Army, focused on peace and security through wisdom. This centre started its journey very recently. OCPASS aims to develop a national strategic culture through independent intellectual and academic pursuits. It seeks to be a credible and unbiased institution in South and Southeast Asia, emphasizing meritocracy. OCPASS would be an autonomous body affiliated with Army Headquarter (AHQ) and governed by a Board of Trustees (Rahman, 2025).

Bangladesh Navy

Bangladesh Navy established a think tank/research organization in 2023, namely the Bangladesh Institute of Maritime Research and Development (BIMRAD). This organization conducts various maritime research projects. In addition, BN established the Navy Training and Doctrine Command (NATDOC), which functions like ARTDOC of the Bangladesh Army and addresses training and doctrinal issues within the Navy (BN Website, 2025).

NATDOC. The Bangladesh Navy plays a leading role in maritime governance and protects the country's sovereignty and territorial integrity in its maritime area. In its wake, NATDOC has been established to formulate and update maritime doctrine and to monitor and evaluate personnel training and preparation in light of National Maritime Interests.

BIMRAD. BIMRAD is a research and development institution dedicated to promoting maritime research, innovation and development in Bangladesh. The organization focuses on strengthening the maritime industry through comprehensive research, training and the development of cutting-edge technology in shipping, maritime safety, fisheries and environmental sustainability (BIMRAD Website, 2025).

Bangladesh Air Force

The Bangladesh Air Force (BAF) has yet to establish a dedicated think tank or a service HQ-level research organization. However, the required research is being carried out by branches of Air Headquarters. BAF also takes assistance from the Aviation and Aerospace University, Bangladesh (AAUB) for specific research requirements. Recently, BAF has also planned to establish an organization to address doctrinal matters. This organization is likely to be similar to ARTDOC of the Bangladesh Army.

Overview of Non-Military Think Tanks in Bangladesh Related to Defence

Apart from military think tanks, there are a few think tanks/research centres in Bangladesh that work on international affairs, security, strategic and developmental issues, geopolitics, foreign policy,, and a a broad spectrum of peace and security studies in the region. However, a few of these think tanks also conduct broad research on defence related issues. Two renowned think tanks in Bangladesh are the Bangladesh Institute of International and Strategic Studies (BIISS) and the Bangladesh Institute of Peace and Security Studies (BIPSS).

BIISS. BIISS is an autonomous statutory institution established by the Government of the People's Republic of Bangladesh in the year 1978. This is a premier think tank organization of Bangladesh under the Ministry of Foreign Affairs. The main responsibilities of this institute include conducting studies, conducting research, and disseminating knowledge on various national and international issues related to traditional and non-traditional security, international relations, peace and conflict, economics, development, and strategic aspects, among others (BIISS Website, 2025).

BIISS is a leading institution in Bangladesh for in-depth analysis across the broad spectrum of peace and security studies in the region and beyond. It is an independent think tank that provides a significant platform for strategic thinkers, academics, members of the military, and civil and foreign service personnel to develop a comprehensive framework for addressing peace and security issues (Muniruzzaman, 2025).

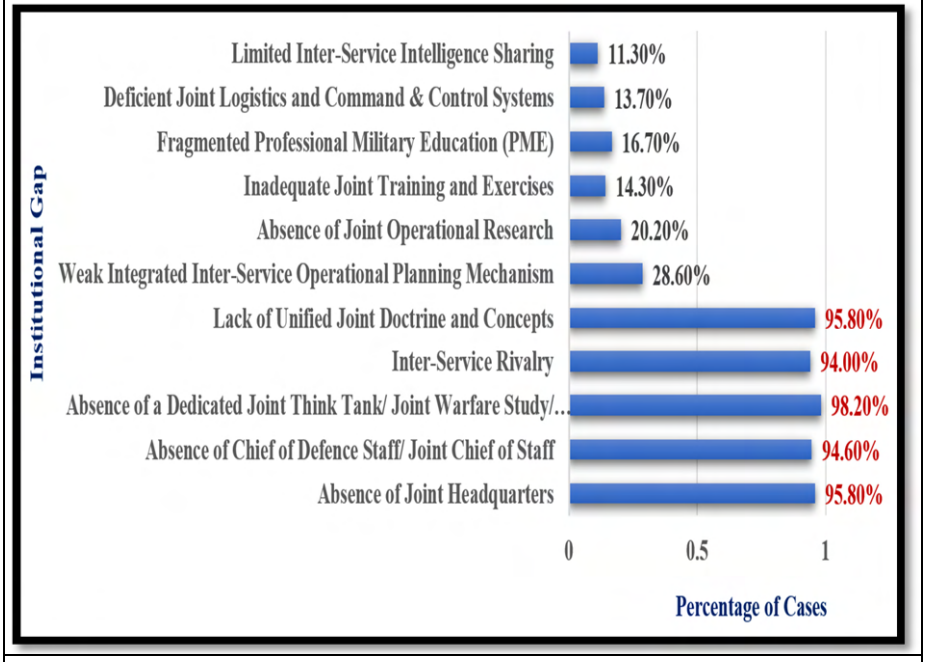
Institutional Gaps in Joint Warfare Study and Inter-Service Coordination in Bangladesh

An analysis of military and non-military think tanks reveals a substantial institutional gap in joint warfare study and inter-service coordination

within the BDAF. The Bangladesh Army's ARTDOC and OCPASS, the Navy's NATDOC and BIMRAD, and the Air Force's limited research mechanisms are confined to their respective domains (Karim, 2025). In addition, existing premier institutions such as NDC and DSCSC are well-suited for higher- and mid-level professional military education and lack dedicated research on tri-service operational issues. Military institutions also engage in very limited academic collaboration with strategic think tanks such as BIISS and BIPSS (Anis, 2025).

Similarly, survey responses shown in Figure 3 reflect deep concern about the structural and institutional gaps that threaten the BDAF's joint capability. The absence of a structured, dedicated Joint Think Tank for JWSC is the most prominent gap (98%), underscoring the lack of an institutional platform for doctrinal innovation and policy research.

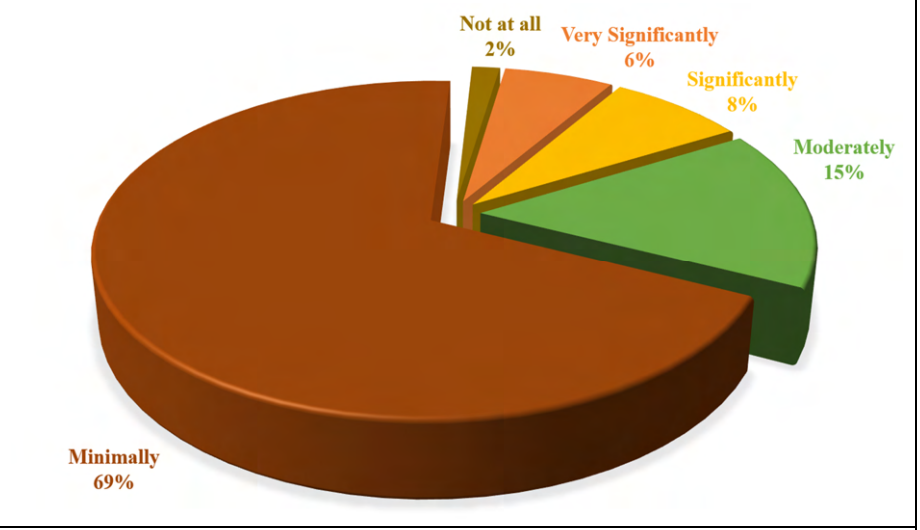
Figure 3: Institutional Gaps Hindering Joint Warfare Capability



Source: Researcher's Self-Construct Based on Survey Response

The survey results (Figure 4) reveal a prevailing perception that existing research institutions in Bangladesh contribute little to joint warfare studies. A clear majority, 69%, considered their contribution minimal, while a further 15% rated it as moderate. These findings illustrate the present institutional gap in Bangladesh, underscoring the inadequacy of existing arrangements to address the growing need for structured joint warfare studies (Survey Response).

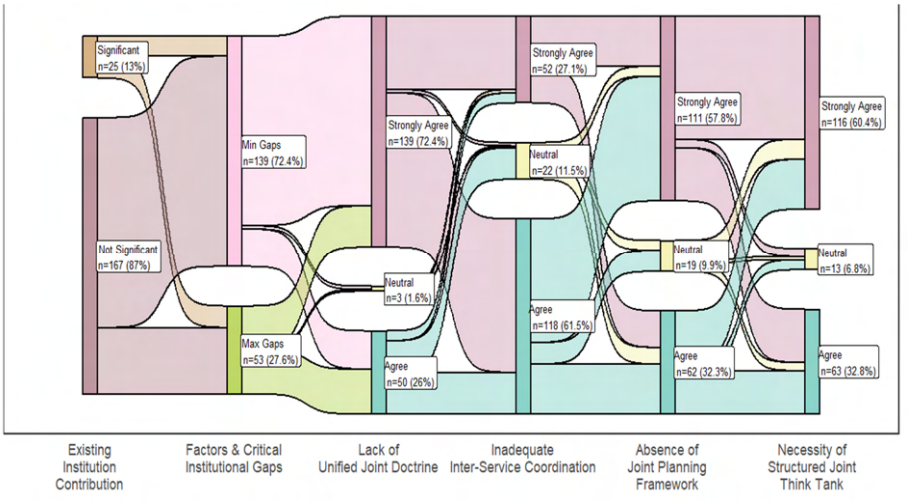
Figure 4: Existing Think Tanks' Contribution to Joint Warfare Study/ Research



Source: Researcher's Self-Construct Based on Survey Response

Descriptive and Visual Analysis. This section presents a visual evaluation of the survey responses using a Sankey diagram. The Sankey plot reveals that the evaluation of organisational capacity, perceptions of doctrinal and operational gaps, and ideas about the necessity of a JWSC are interconnected in this study. The Sankey plot not only highlights areas of strong consensus but also uncovers variations in perceptions, reinforcing the strategic case for effective institutionalising joint warfare studies in Bangladesh.

Figure 5: Progression of Perceptions Portrayed through Sankey Diagram



Source: Researcher's Self-Construct Based on Survey Response

The above Sankey plot (Figure 5) focuses on the chain of perceptions linking institutional contribution, critical gaps, doctrinal absence, inter-service coordination, planning frameworks, and the need to establish a structured Joint Think Tank. A dominant 87% of respondents rated the contribution of existing institutions as not significant, with the majority of this group identifying a low level of institutional capacity (72.4%). In comparison, a smaller proportion (27.6%) perceived maximum gaps. These interlinked deficits culminate in an almost unanimous call for institutional intervention: 60.4% strongly agreed and 32.8% agreed that a structured Joint Think Tank is necessary.

Comparative Analysis of Global Models of Joint Warfare Study

In the contemporary security environment, leading militaries worldwide have recognized that interoperability among services cannot be achieved through ad hoc coordination but must be fostered through dedicated doctrinal institutions, joint training frameworks, and integrated strategic research platforms. These institutions not only bridge the gap between

strategy and operations but also promote civil-military collaboration and policy-relevant scholarship (FGD-1).

Selected Global Models. This study analysed six global models of joint warfare study institutions from China, India, Japan, Pakistan, Türkiye and the United Kingdom shown in Table 1. These countries were selected for their diverse geopolitical contexts, levels of defence modernization, and proven experience in operationalizing joint warfare doctrine through structured institutions (Muniruzzaman, 2025).

Table 1: Selected Global Models

Country	Institution Name	Established
China	Academy of Military Sciences (AMS)	1958
India	Centre for Joint Warfare Studies (CENJOWS)	2007
Japan	National Institute for Defence Studies (NIDS)	1952
Pakistan	Institute for Strategic Studies, Research and Analysis (ISSRA), NDU	2000
Türkiye	Multinational Joint Warfare Centre (MJWC)	2015
UK	Integrated Training Solutions (ITS) – Global, (UK MOD)	2000

Source: Researcher's Self-Compilation from Open Sources

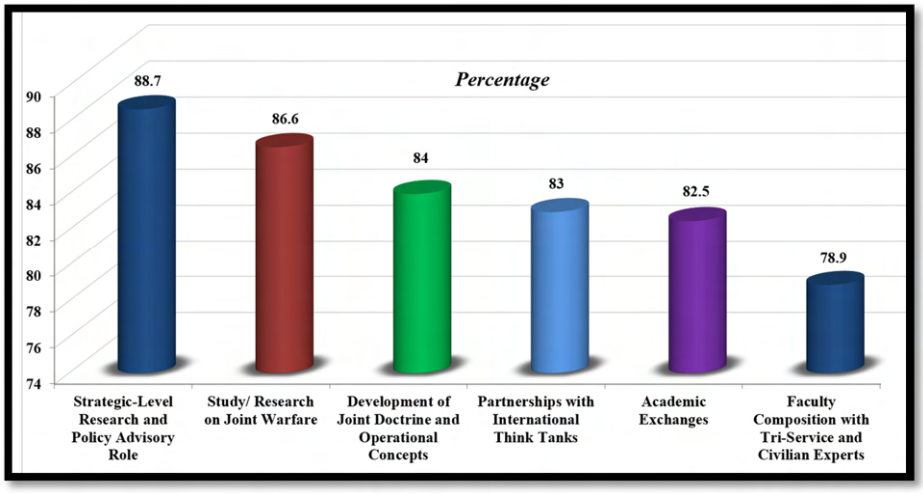
Lessons Learned and Applicability to Bangladesh

Global models such as NIDS and ISSRA demonstrate the value of combining strategic research with military education. Institutions such as CENJOWS and ISSRA operate autonomously while remaining strategically aligned. MJWC and ITS stress practical training through simulations and wargaming. High-end simulation, as in AMS or MJWC, may be difficult to replicate without policy support and capacity-building (Mainur Rahman, 2025). The structure may reflect a cluster-based model, deliberately organized around four interdependent pillars: Academic & Research Cluster, Doctrine & Operational Integration

Cluster, External Engagement Cluster, and Enabling Services. These pillars will have related divisions (Mahboob Sarwar, 2025).

The survey results (Figure 6) highlight the priority areas for the prospective JWSC in Bangladesh. The highest response was for a strategic-level research and policy advisory role (88%), highlighting the necessity for an institution to address national defense policy and strategic planning.

Figure 6: Bangladesh's Priority Learning from Global Institutions



Source: Researcher's Self-Construct Based on Survey Response

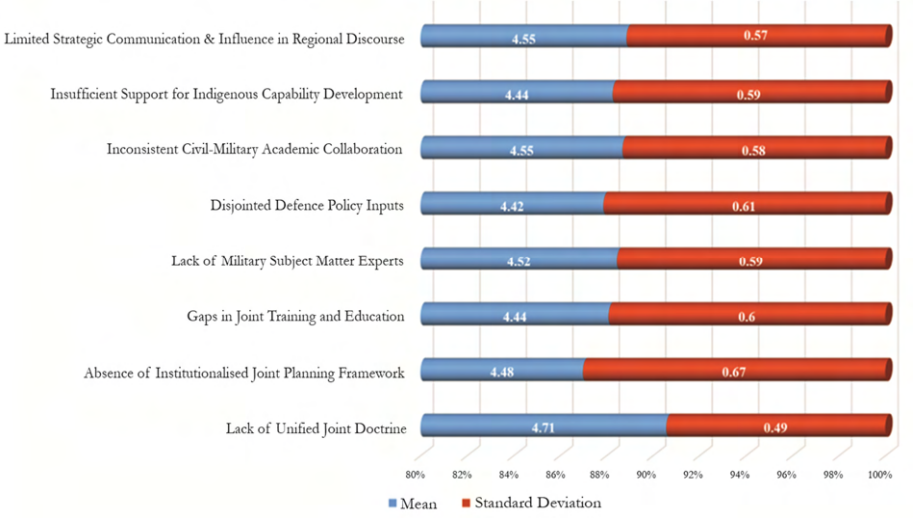
Requirement and Feasibility of a Structured Joint Warfare Study Centre

The absence of an effective, structured joint warfare education platform within the BDAF has led to disjointed doctrinal development, inadequate joint operational planning capacity, and a culture of ineffective inter-service cooperation (Aminul Karim, 2025). In addition to academic and administrative endeavour, establishing a structured and effective study centre is a necessity to modernise force readiness and respond to emerging security threats.

Existing Challenges Arising from the Absence of a Structured JWSC

The lack of a central institutional platform for harmonizing joint doctrine, conducting integrated planning and generating strategic-level research has significantly impeded the development of jointness, a core requirement for addressing the evolving security challenges of the 21st century. Survey responses shown in Figure 7 provide strong evidence of the challenges arising from the absence of a structured JWSC within BDAF. The greatest concern was associated with the lack of unified joint doctrine (Mean 4.71), reflecting a critical void in doctrinal integration across the services. Together, these findings justify the immediate establishment of JWSC.

Figure 7: Existing Challenges from Absence of a Structured JWSC



Source: Researcher's Self-Construct Based on Survey Response

Theoretical Model for Needs Assessment

The integration of theoretical models for needs assessment provides a structured framework for identifying and addressing performance deficiencies. Among several established models, Kaufman's Needs Assessment Model offers a multi-tiered approach: Mega (societal/national), Macro (organizational/institutional), and Micro (individual/functional) (Kaufman, 1992). Roger Kaufman, PhD, was a former professor and director of the Office for Needs Assessment and Planning at Florida State University, USA.

Synthesized Needs Matrix. The synthesized needs matrix is prepared for the Mega, Macro, and Micro levels and is shown in Table 2.

Table 2: Synthesized Needs Matrix

Level	Identified Gaps	Proposed JWSC Functions
Mega	No strategic input during crises, weak defence diplomacy capacity	National-level policy support, strategic publications, regional and international outreach
Macro	Disjointed doctrine, fragmented procurement, no joint planning or exercises	Joint Doctrine Division, Simulation & Wargaming Cell, Strategic Capability Development Unit
Micro	Late and limited PME exposure, no incentives for research or inter-service synergy	Officer research fellowships, PME integration, joint operational curricula and publications

Source: Researcher's Self-Construct Based on Kaufman's Needs Assessment Model

Needs Assessment Based on KII, FGD and Survey

Word Cloud of Key Phrases Based on KII. The word cloud of key phrases, prepared using NVivo Software, is shown in Figure 8.

Figure 8: Word Cloud of Key Phrases – Necessity of JWSC



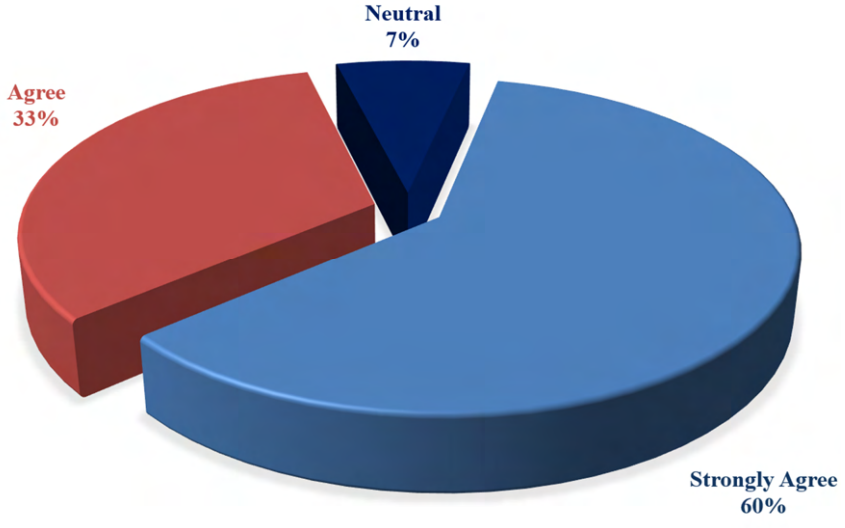
Source: Researcher's Self-Construct Based on NVivo-Based Thematic Analysis of KII

The word cloud from the key informant interviews illustrates the conceptual core of the need to establish the Joint Warfare Study Center. More pronounced terms such as Joint Doctrine, Strategic Integration, and Capability Development indicate a firm consensus on the necessity of harmonized doctrinal frameworks and force-structure alignment among the tri-services. The repeated emphasis on Interoperability, Civil-Military Integration, and Cross-Service Cooperation reflects the current gap in joint operational synergy and crisis-response mechanisms.

FGD. Focused Group Discussions portrayed a clear consensus on the immediate need to establish a JWSC in the BDAF. Strong convergence of views in both FGDs conducted at Defence Services Command and Staff College and Armed Forces Division, provides captivating evidence of institutional demands, directly reinforcing the research objectives of assessing necessity, examining feasibility and recommending a structured and effective framework for institutionalising joint warfare studies within the BDAF.

Survey. The survey response of the question related to 'Requirement of Establishing a JWSC' is portrayed in Figure 9. The vast majority of respondents (60.3%) strongly agreed that establishing a structured JWSC in Bangladesh is necessary. Further 32.5% survey respondents agreed, raising overall support to 92.8%. Accordingly, the survey response demonstrates overwhelming, near-unanimous endorsement of the proposal. The survey results, FGD findings, and outcomes of almost all KIIs mutually validate one another, providing robust and convergent evidence of institutional demand for the immediate establishment of a JWSC.

Figure 9: Requirement of Establishing a JWSC



Source: Researcher's Self-Construct Based on Survey Response

Feasibility Assessment

The success of a JWSC depends not only on institutional necessity but also on a rigorous assessment of its practical feasibility. The research completed a comprehensive feasibility analysis, drawing upon a combination of analytical tools: Strengths, Weaknesses, Opportunities and

Threats (SWOT), Political, Economic, Social, and Technological factors (PEST), and Benchmarking, focusing on seven core dimensions: policy support, organizational readiness, financial viability, human resources, infrastructure feasibility, academic partnerships, and strategic alignment.

Political and Strategic Support. There is a strong political alignment between the national security policy and the establishment of a JWSC. The center supports the goals of doctrinal modernization and complements regional security ambitions. KIIs confirmed that the Armed Forces Division (AFD) and Ministry of Defence (MoD) are conceptually supportive (Masihur Rahman, 2025).

Institutional Readiness. Institutionally, BDAF has the academic and structural base to establish a JWSC. Tri-service institutions like NDC and DSCSC already offer tri-service programs and could serve as appropriate anchors for JWSC. Although inter-service coordination mechanisms remain underdeveloped, existing inter-service training or education platforms and doctrinal planning experience are strengths (Mahfuzur Rahman, 2025).

Financial Viability. The budget for establishing JWSC is modest compared to various hardware-driven modernisation programs. By co-locating the JWSC at AFD, NDC, DSCSC, or Bangladesh University of Professionals (BUP), initial funding requirements may be minimized (Mahbub-Ul-Alam, 2025).

Human Resource Availability. The availability of subject matter experts, military educators, and interdisciplinary researchers remains a key constraint. Survey responses recommend a rotational staff model that blends serving officers with retired experts and civilian academics (Survey Response, 2025).

Infrastructural Feasibility. Existing BDAF facilities at NDC, DSCSC, and BUP extend adequate space, administrative support, and IT infrastructure to hold a JWSC core team. Other sections/divisions could be included in the future.

Academic and Research Partnerships. There is significant scope, both at home and abroad, to establish strategic partnerships for doctrinal exchange, research collaboration, and faculty training. Such partnerships will also help host seminars, roundtables, wargames, and multinational exercises under JWSC's banner.

Strategic Alignment with National Security. The JWSC aligns strongly with national strategic goals, including enhancing inter-service coordination and supporting disaster response and civil-military operations.

Developing a Framework for Institutionalizing Joint Warfare Studies in the Bangladesh Armed Forces

Analysing Theoretical Framework for 'Structured Framework Development'

Galbraith's Star Model for JWSC Framework Development. Several theories of institutional design guide how institutions may align their internal framework and capabilities with their strategic objectives. 'Galbraith's Star Model' is well suited to managing complexity, fostering collaboration across various branches, and adapting to environmental variation, which are imperative for a joint warfare organization. Star Model ensures that the institutional framework is not treated in isolation, but rather as one of the five mutually supporting design components. For JWSC, Galbraith's five design elements translate as follows:

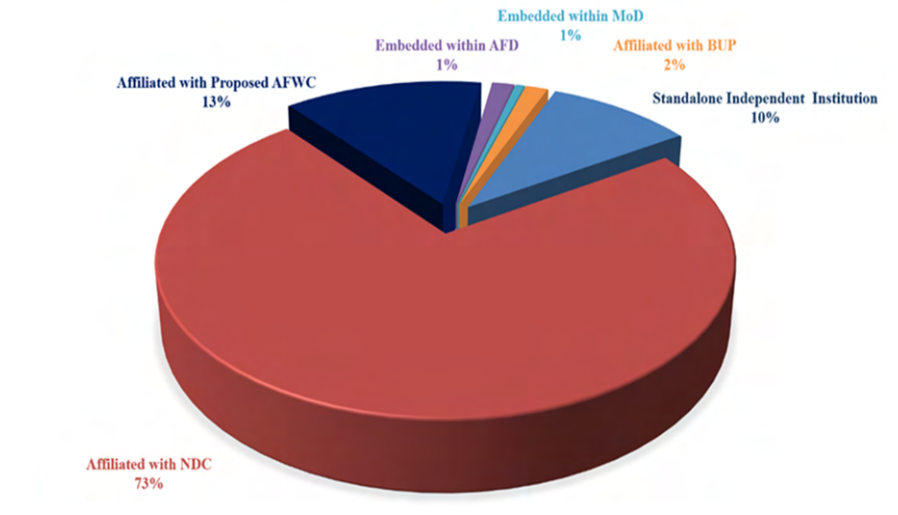
- **Strategy**. Advancing jointness, promoting interoperability and military innovation.
- **Structure**. Interdisciplinary divisions with clear command channels and lateral coordination.
- **Processes**. Collaborative planning, doctrinal validation, strategic forecasting, and joint exercise.

- **People**. Multi-domain staffing with operational, academic, and analytical expertise.

- **Rewards**. Performance-linked recognition to promote innovation, doctrinal impact, and publication.

Organizational Design. The survey response shown in Figure 10 indicates that 73% of respondents opined that JWSC should be established as part of NDC. Similar responses were also received from KII and both FGDs (Survey Response).

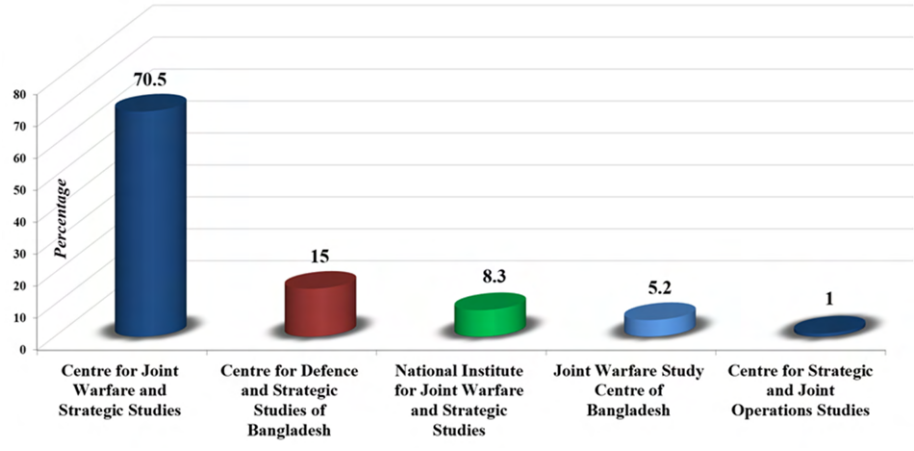
Figure 10: Best Suited Organizational Model for the JWSC



Source: Researcher's Self-Construct Based on Survey Response

Name. The survey findings (Figure 11) indicate a strong preference to name the proposed institution the Center for Joint Warfare and Strategic Studies, with overwhelming support from 70.5% of respondents. The results clearly highlight a dominant consensus around a title that emphasises both joint warfare and strategic studies, reinforcing the dual focus on doctrinal integration and broader national security analysis (Survey Response).

Figure 11: Preferred Name for the Joint Warfare Study Centre



Source: Researcher's Self-Construct Based on Survey Response

Proposed Organizational Structure

Conceptual Overview. Establishing a JWSC requires a conceptual framework and a well-defined, functionally effective institutional structure capable of delivering on its mission. The proposed structure of JWSC reflects a cluster-based model, organised around four interdependent pillars like Academic and Research Cluster, Doctrine and Operational Integration Cluster, External Engagement Cluster and other Enabling Services (Mahboob Sarwar, 2025). These co-dependent pillars will have the necessary divisions shown in Table 3.

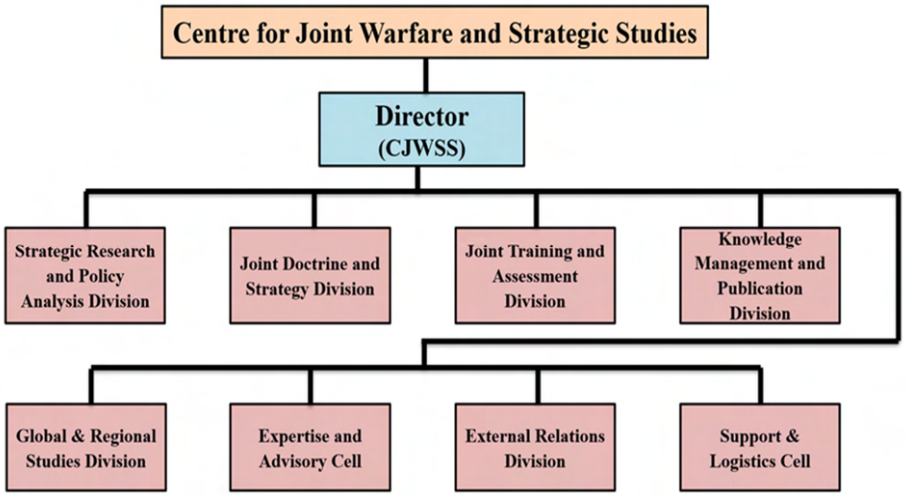
Table 3: Four Cluster-Based Model

Academic and Research Cluster • Strategic Research and Policy Analysis Division • Global and Regional Studies Division • Knowledge Management and Publication Division • Expertise and Advisory Cell	**Doctrine and Operational Integration Cluster** • Joint Doctrine and Strategy Division • Joint Training and Assessment Division
External Engagement Cluster • External Relations Division	**Enabling Services** • Support and Logistics Cell

Source: Developed Based on Various Global Models and Analytical Tools

Proposed Organogram of JWSC. Based on the content analysis, global model study, KII, FGD, and Qualitative and Quantitative Data analysis, a proposed organogram is developed, as shown in Figure 12.

Figure 12: Proposed Organogram of JWSC



Source: Researcher's Self-Construct Based on Content Analysis, Global Models Study, KII, FGD, and Qualitative and Quantitative Data Analysis

Roles of JWSC

The JWSC is envisioned as the intellectual and doctrinal fulcrum for institutionalizing jointness within the BDAF. The centre will serve not only as a doctrinal engine but also as a catalyst for operational integration, strategic foresight, capacity building, and civil-military synergy **(**Bhuiyan, 2025; Mahfuzur Rahman, 2025; Kamrul Hassan, 2025; Mainur Rahman, 2025; FGD-1 and FGD-2).

Doctrinal Development and Joint Strategy Formulation. The proposed JWSC will lead the development, analysis, validation, and revision of joint warfare doctrines that span the land, maritime, air, cyber, and space domains. These doctrines will be prepared through a deliberate and iterative process involving research, field validation, simulation-based testing, and fellow feedback (Masihur Rahman, 2025)

Strategic Research, Analysis, and Foresight Generation. JWSC will serve as a research think tank that informs both defence leadership and national security policy stakeholders. Research outputs of this proposed institution will span conventional, sub-conventional, unconventional, and non-traditional security dimensions and engage in comparative studies, threat forecasting, and capability assessment (Rasheduzzaman, 2025).

Joint Training Support. The JWSC will contribute directly to institutionalizing jointness in training and professional military education (PME) by integrating joint operational concepts into existing academic structures and developing new training models (Mainur Rahman, 2025).

Effective Communication and Civil-Military Collaboration. Effective strategic communication is very significant in the modern information domain. The proposed JWSC will assume a proactive and effective role in engaging stakeholders, shaping defence discourse and fostering civil-military engagement (Bhuiyan, 2025; Kamrul Hasan, 2025).

Capacity Development and Knowledge Management. As a knowledge-centric institution, JWSC will be able to develop human capital and ensure doctrinal continuity through well-thought-out knowledge management (Mahfuzur Rahman, 2025; Mahboob Sarwar, 2025).

Policy Advisory and Strategic Guidance to Defence Leadership. The proposed JWSC will be able to operate as a policy advisory platform to military leadership and security policymakers. This institution will provide strategic recommendations based on policy research, threat analysis, and joint operational feedback (Misbah, 2025; Shahab Enam Khan, 2025).

Implementation Framework

Establishment of the JWSC needs to be phased, pragmatic, and strategically aligned with national defence priorities. A 'SMART' framework (Specific, Measurable, Achievable, Relevant and Time-bound) is proposed to ensure the long-term sustainability, operational viability and policy coherence of the JWSC. This framework is divided into four sequential phases, each phase focused on critical pillars of effective institutional building. The summary of the implementation roadmap is given in Table 4.

Table 4: Implementation Roadmap Summary

Phase	Timeframe	Core Focus	Key Outputs
I	3-6 months	Feasibility & Budget Approval	Govt approval, stakeholder buy-in, initial allocation
II	6-12 months	Pilot Operations & Staffing	Core staff hired, trial doctrines, research projects initiated
III	12-24 months	Full Institutionalization	Permanent facility, academic programs, international linkages
IV	Year 2-5	Evaluation & Strategic Modification	Revised structure, M&E feedback, long-term plan

Source: Constructed by the Researcher Based on KII and Content Analysis

Recommendations

The following policy recommendations are offered to support the establishment of the JWSC and promote inter-service integration and capacity-building:

Policy Endorsement and Approval. AFD, in coordination with MoD, may endorse establishing the JWSC. A directive may be issued to ensure the institutional legitimacy and strategic alignment with national security.

Allotment of Dedicated Budget. MoD may allocate a dedicated, recurring budget to JWSC to ensure the smooth execution of the establishment plan.

Pilot Phase. AFD may take necessary endeavours to start functioning of JWSC within NDC. Initially, two core divisions: Doctrine and Joint Strategy Division, and Strategic Research and Policy Analysis Division may start their function.

Coordinated Staffing and Talent Acquisition. AFD may arrange the posting of required qualified serving personnel from BDAF. Subsequently, JWSC may recruit civilian scholars and retired military experts as fellows, advisors, or researchers.

Conclusion

Significant doctrinal, structural, and strategic shortcomings within the Bangladesh Armed Forces were revealed through the study. These gaps are mostly due to the absence of a dedicated institutional mechanism to lead jointness among the three services. Forces continue to function within service-centric domains. This restricts effective interoperability, constrains integrated planning, and hinders effective operations during crises. The lack of a JWSC has further impeded doctrinal harmonisation, joint training development, and the evolution of an integrated operational culture. Kaufman's needs assessment model identified systemic flaws at national, institutional, and operational levels. These

findings determine that the existing framework is inadequate to fulfill the requirements of contemporary and future security environments.

The research also facilitated strong stakeholder convergence, with the majority endorsing the need for a structured joint warfare institution. Lessons derived from global models like NIDS of Japan, CENJOWS of India and ISSRA of Pakistan demonstrate the strategic advantages of an institutionalised platform for joint research and training. These comparative insights boost the necessity of establishing a JWSC for BDAF. Such an organisation would enhance doctrinal coherence, enable effective capacity building and strengthen national defence preparedness. Therefore, the study concludes that establishing the JWSC is essential to advancing jointness and enhancing the BDAF's long-term strategic posture.

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THE ROLE OF TECHNOLOGY TRANSFER AND JOINT VENTURES IN UNMANNED AERIAL VEHICLE PRODUCTION FOR THE BANGLADESH AIR FORCE: A DRIVE TOWARDS SELF-RELIANCE

Group Captain Azim Ahmed, afwc, psc, GD(P)

Introduction

In today's fast-changing global security landscape, modern military strategy relies primarily on technological innovation. To face today's challenges, a country needs to invest in robust industrial capacity and innovative research and development. In the present context, the most important tools in military operations are Unmanned Aerial Vehicle (UAV). UAVs are capable of performing surveillance, real-time intelligence, and carrying out tactical missions without a pilot on board. UAVs have revolutionized modern warfare by being adaptable, low-cost, and readily available in many tactical environments; the Bangladesh Air Force (BAF) depends on procuring UAVs from foreign countries. The unavailability of foreign technologies, geopolitical instability, potential disruptions to international supply lines, and the growing complexity of contemporary warfare can seriously undermine the BAF's operational readiness. The BAF has already responded by starting projects to enable indigenous UAV manufacture. It would be a matter of national pride for the BAF to achieve self-reliance in UAV production. It is a strategic need that requires developing a strong framework for Technology Transfer (ToT) and Joint Ventures (JVs) with experienced multinational manufacturers. Specialized skills in UAVs are required for sustainable UAV manufacturing, and local engineers and technicians need to undergo critical training. PPP in defence manufacturing and production shows that cooperative models

backed by legal support and study Research & Development (R&D) funding can lead to technological self-reliance (Chander, 2019). This study examines how ToT and JV initiatives can develop UAV manufacturing capacity to achieve BAF self-reliance. The goal is to create a strong foundation for long-term independence and to improve operational readiness. It seeks to reduce dependence on imported UAV systems. Presently, UAVs serve as a deterrent and a force multiplier for smaller air forces that do not possess 5th- generation fighter aircraft (Danczuk, 2023).

Research Methodology

An exploratory study was conducted to achieve the research objective. The scope of this research was limited to the role of ToT and JV in UAV production for BAF future self-reliance. The study is based on a theoretical approach and is limited to ongoing R&D activities and the best Practices of ToT and JV that can be applied to BAF. A total of 10 interviews were conducted with concerned BAF officers. A Focus Group Discussion (FGD) consisting of 02 groups from BAF and Bangladesh Aviation and Aerospace University (BAAU) was also conducted. Secondary data were collected from relevant documents, articles, research reports, and similar sources. The data collected through the field survey, document study, and interview method were analyzed subjectively to derive necessary logical explanations of concepts and to identify linking phenomena or arguments to attain the objective of the research.

Key Findings of the Research

The research consists of five chapters, namely, Chapter 1: Introduction, Literature Review and Research Design, Chapter 2: Present State and Development in BAF, Chapter 3: Present Challenges in UAV Production and Implementation of ToT and JVs, Chapter 4: Overcoming Challenges and Implementing Best Practices for Foreign

Collaboration of ToT and JVs in UAV Production for BAF and Chapter 5: Conclusions and Recommendations. Key findings of the research are covered in Chapters 2 to 5, which are briefly highlighted subsequently.

Present State and Development in BAF

BAF has relied on foreign countries to procure most of its aircraft and radar systems to meet its operational requirements for many years. This foreign procurement is draining a lot of foreign currency every year. BAF has experienced difficulties in the past and is likely to encounter problems during future crises. Foreign procurement ultimately leads to dependency, low self-reliance, and supply chain risks. Türkiye's defence industrial transformation following the 1974 arms embargo illustrates how strategic isolation can catalyze indigenous military industrial innovation (Akca & Yavuz, 2020). This is the right time for BAF to change from a buyer to a builder. BAF's current initiatives are the establishment of the Aerospace Research and Development Complex (ARDC) and the establishment of Propeller Repair and Overhaul Shop (PROS). It also critically evaluates the institutional, organizational, and regulatory barriers. The modernization roadmap outlined under Forces Goal 2030 provides a strategic backdrop of BAF's technological aspirations. The plan, approved in 2010 and revised in 2017, envisions a technologically advanced and well-equipped force (Mahboob, 2023). This national doctrinal framework has opened significant opportunities for UAV ToT and JVs. Bangladesh's defence industry in aerospace and UAVs is still underdeveloped. UAVs would give BAF sharper eyes on the border and stronger force projection. This is vital because Bangladesh lies between two large military powers. For developing air forces, their use is seen as a significant force multiplier (Muna, 2024). Multidomain threats in the Bay of Bengal demand the seamless integration of air and maritime surveillance. Bangladesh faced 47 reported airspace violations in 2022-23. These incidents show the urgent need to improve surveillance. Bangladesh must invest in indigenous UAVs. It must also develop integrated C4ISR systems (Tibro, 2024).

Since 2008, BAF has been developing its own UAVs. ARDC has completed test flights of several models. These include the Kilo Experimental-2 (KX-2) for close-range missions, the Night Fury (NFX-2) for short-range surveillance, and the med sized armed quadcopter (QXL-1) [a Vertical Takeoff and Landing (VTOL) drone]. These projects show BAF's shift from dependence on foreign sources to local capability. Key areas like flight control, ground systems, composite materials, and system integration require high-tech support. These tools will help BAF improve its UAV program and support long-term innovation (Rahman, 2025). The BAF aims to develop its own UAVs for surveillance and combat use. BAF's first endeavor to develop indigenous target drones experienced repeated failures and weak project management. This project tried to develop jet target drones. However, many flight tests failed. The main issues were launch instability and problems with the drone's V-tail structure. The V-tail could not stay stable during catapult launches. These failures happened with similar designs, but lessons from the past were not taken into consideration. The documents show that the engineering process lacked sufficient simulation or careful review before test flights, and that projects remained stuck at the prototype stage and did not move forward (Asad, 2025). Since 2020, a team of engineers and technicians has designed and flown several UAVs. These include the KX for close-range surveillance, the NFX for light reconnaissance, and the DFX, a tri-copter for ground support. A new VTOL UAV is also being developed that can take off and land vertically. ARDC has also built a small quadcopter for tasks like disaster relief and payload delivery. BAF is growing skills in UAV design and testing. However, ARDC still cannot mass-produce UAVs and needs more work on control systems and communications. The goal is to gain full manufacturing ability by 2027 (Rahman, 2025). However, many problems still exist; UAVs are not moving from test models to real use. The teams working on UAVs need to be well-connected and able to continue working for a reasonable period. To succeed, BAF must run its small projects into one big, smart, and well-funded UAV program.

Present Challenges in UAV Production and Implementation of ToT and JV

BAF has long experience in the maintenance and overhaul of aircraft and helicopters. A long history of operation and maintenance has developed a large pool of engineers and technicians. Recently, BAF undertook the challenge of developing an indigenous close-range UAV for reconnaissance and surveillance, with a planned future combat upgrade. A team of engineers and technicians has developed two prototypes, conducted several tests, and is preparing for further flight trials. However, the team faced major challenges, broadly categorized as design limitations, material constraints, avionics dependency, and lack of validation infrastructure. BAF officers, though academically trained, lack industry-level exposure to design and research. Design work also requires access to industrial databases and software unavailable to BAF.

Key Technological and Operational Challenges

BAF has long experience in the maintenance and overhaul of aircraft and helicopters. A long history of operating and maintaining the fleet has created a large pool of engineers and technicians. BAF recently undertook the challenge of developing an indigenous close-range UAV for reconnaissance and surveillance, planned for future upgradation to a combat UAV. A team of engineers and technicians has been working toward this objective. The team has developed two prototypes, conducted several ground and flight tests, and is currently preparing for further flight tests. However, the team faced several challenges in the design and production. These challenges are categorized as design limitations, material constraints, avionics dependency, and lack of validation infrastructure. UAV development requires a high degree of innovation, integration, and prototyping, similar to conventional aircraft maintenance or overhaul activities.

Design Constraints and Engineering Isolation

BAF does not have industry-level exposure to the design of ac/UAV. BAF officers have only academic exposure. This exposure and the necessary design software were not used. However, design requires various industry data that are not accessible to BAF. Long-term, sustained investment in engineering education, R&D, and industry collaboration can address this shortfall. ToT can also mitigate this issue; however, it will still need engineers with adequate understanding and academic exposure. The academic background of BAF engineers is strong in theory. However, they lack practical design experience as they do not have access to global UAV research networks. This has limited their ability to design state-of-the-art aerodynamic principles and adaptive designs. UAVs are inherently complex in their control systems and require precision aerodynamics, redundancy planning, and built-in fail-safe mechanisms.

Lack of Access to Critical Materials

UAV development in BAF requires access to aviation-grade materials, which include composites, aluminum, and steel. They are vital for spares, tails, and landing gear. Such materials are not available in Bangladesh. They are also difficult to access from abroad, which is a major setback for UAV development. Composite materials such as carbon fiber-reinforced polymers are essential because they reduce weight while maintaining structural strength. The certified aerospace-grade materials are too expensive and difficult to purchase under the existing procurement policy.

Limitations in Avionics and Flight Systems

Avionics for UAVs are crucial in ensuring long-range communication, flight control systems, and sensors. It is not possible to access appropriate avionics items without industry collaboration. Currently, only off-the-shelf avionics items are being used, which have limited

capability and make test flights difficult. Avionics are the nervous system of UAV platforms. Every element must be seamlessly integrated and rigorously tested, from Global Positioning System (GPS) modules to autopilot systems and Electro Optic/Infra-Red (EO/IR) payloads. At present, BAF uses Commercial off-the-shelf (COTS) avionics systems that have a very limited range for operational UAVs. These systems also lack secure data links, encrypted communications, and programmable mission control interfaces.

Absence of Design Validation Infrastructure

BAF team has been able to design the UAV. However, validation of the design is currently not possible due to the non-availability of simulators. Design validation is one of the key steps in transitioning from design development to the operational deployment of UAV systems. Currently, BAF lacks the wind tunnels, structural load test benches, and system-level simulators needed to validate UAV designs. The well-conceived designs cannot progress beyond hand-crafted models without having those facilities. Each crash or system failure is a costly lesson for BAF, as there is no engineering simulation for flights. Rectify such errors before testing.

Funding and Procurement Constraints

Bangladesh Armed Forces do not have a joint budget management body. This makes long-term planning and teamwork between the services difficult (Mabud, 2017). It also affects how BAF equipment is purchased and how research on projects like UAVs continues. One major problem in building UAV capability within BAF is the lack of steady, long-term funding. Projects by ARDC often get money only for a short time. There is no fixed budget for full development, testing, or production of UAVs. In countries such as India and Türkiye, UAV programs receive funding across multiple phases. Their projects grow step by step, from design to mass production.

BAF funds are often used to fulfill short-term needs. Without long-term funds, it is hard to build test centers, labs, or factories. These are needed to support full UAV development and future production. To address this, BAF should establish a dedicated UAV Innovation Fund. This should run by the Ministry of Defence or the BAF. It should support projects for 5 to 10 years. The present procurement system of BAF focuses on buying ready-made systems from foreign countries. This helps to fulfill the short-term requirement but does not support long-term development. Most UAV systems come fully built, with no room for local upgrades or learning. There is no clear plan to promote local design or production, unlike in India. Bangladesh has no offset rules that require technology transfer or local assembly. PPP rules exist, but there is no PPP law to guide defence projects. This keeps good private partners away (Khan, 2012). If policies and processes are weak, advanced tech partnerships can suffer delays in JV projects (Economic Laws Practice, 2019).

Government-to-Government (G2G) Contract with ToT

G2G contracts are useful for ToT in the defence sector. They are often used in sensitive areas, such as UAVs. These contracts are made between governments, not private companies. This helps speed up the process, reduce the risk of sanctions, and provide access to important technologies. For BAF, G2G contracts offer a safe way to get new defence technology. This agreement will include clauses for training, local production, and knowledge sharing. Good G2G contracts will also include offset clauses, such as joint development capabilities through ToT and JV. Countries like Türkiye and Pakistan have used G2G deals to boost their UAV programs. However, for ToT to work, a country must be ready. It needs the right infrastructure, trained people, and strong institutions (Krishna, n.d.). Türkiey used Israeli UAVs. However, when it faced restrictions, it started to make its own. The government provided support to companies such as Baykar and Turkish Aerospace Industries (TAI). These companies got help from the defence ministry

and funding for R&D. they also made deals with other countries to get spare parts and knowledge. Over time, Türkiye began designing and exporting drones such as the Bayraktar TB2 and Akinci. Pakistan followed a different path. It worked closely with China through G2G defence deals and China gave drones like Wing Loong and CH-4 to Pakistan. It also shared parts, control systems, and sensors. Pakistani organizations such as National Engineering and Scientific Commission (NESCOM) and Pakistan Aeronautical Complex (PAC) helped adapt and sometimes build these drones locally. Pakistan's program is less independent than Türkiye's. However, it has shown how G2G deals can help. Both cases have shown that G2G deals work best with strong political support, stable institutions, and clear industrial goals. BAF can learn from these models. BAF must make sure its G2G contracts support long-term goals, not just short-term needs.

Challenges and Benefits in G2G Frameworks in BAF

G2G contracts offer both benefits and challenges. On the positive side, G2G deals will help BAF acquire key military technologies, including UAVs, control systems, and avionics. These deals are safe and stable. They avoid the risks of open bidding. G2G contracts often include training and ToT. With G2G, BAF can also partner with countries like Türkiye and China. These deals can help BAF design, test, and build drones locally. This reduces risk and builds local skills. However, there are challenges too. There are not enough trained people. In the past, many G2G contracts for BAF focused only on buying equipment. In those G2G contracts, BAF needs to reform. BAF should make a clear policy to integrate ToT and JV for UAV production in BAF. Without these steps, G2G contracts may remain simple purchase deals. They will not help build real self-reliance. ToT is very important for countries like Bangladesh. ToT helps reduce dependence and accelerate adoption of new technologies (Krishnan, n.d.). Survey results from defense experts show clear advantages of G2G engagements for UAV ToT. These benefits go beyond simple technical acquisition.

Public-Private Partnership (PPP) Potential and Limitations

PPPs are becoming important in building defence industries. This is true for areas like aerospace and UAVs. PPPs differ from traditional defense procurement. They will allow both the government (BAF) and private companies to share risks and benefits, bring new ideas, and speed up production. The government (BAF) will give direction, and private firms will bring technical skill and efficiency. PPPs in Bangladesh can help grow local defense industries with government support. Private companies can help with quick testing, flexible design, and large-scale production of UAVs by investing in PPP. However, for PPPs to succeed, private companies must invest, and clear rules and strong government support are needed (BAF). Intellectual property must be protected. The public sector must stay committed for the long term. Bangladesh is trying to use PPPs to boost investment in technology. However, complex rules and weak institutions have slowed the progress in defence areas (Hossain, 2016). India's experience shows how PPPs can work well.

Under "Make in India" and "Atmanirbhar Bharat," India introduced special PPP rules, including "Make-I" and "Make-II." These helped local companies to design and build defence equipment. Indian companies such as Tata, Adani, and IdeaForge collaborated with Defence Research and Development Organisation (DRDO) and global firms such as IAI. Together, they built drones such as the Rustom and the Heron TP. India went from just assembling drones to designing and exporting them. India's success came from tax breaks, sound laws, funding for innovation, and defense industry zones. So far, there has been no experience with PPPs in Bangladesh's defense sector.

There is no major private involvement in building UAVs or any aerospace systems. The Bangladesh government has PPP rules for roads and the power sector. The existing PPP system of Bangladesh also faces many problems. Private partners are not properly checked. Different groups are

in charge, but they do not work together (Khan, 2010). PPP for defence projects requires special consideration, such as export controls, IP protection, and national security checks. At present, there is no clear defence industrial policy to guide private investment. Also, Bangladesh does not have any defence innovation centers, startup funding, or incentives for private firms to work with BAF on UAVs. Still, Bangladesh has many young technical workers and few private engineering companies are interested in defence work. With the right policies, BAF can think for a special Defence PPP cell, support for "Make in Bangladesh" defence projects and UAV co-development programs.

Overcoming Challenges and Implementing Best Practices for Foreign Collaboration of ToT and JVs in UAV Production for BAF

To achieve self-reliance in UAV manufacturing, BAF must implement a holistic approach across five pillars: organizational restructuring, regulatory streamlining, policy realignment, institutional capability development, and strategic diplomacy. Earlier PPP experience in Bangladesh shows that weak transaction expertise and limited project development funding have repeatedly slowed infrastructure delivery (Rashed, Alam & Faisla 2013). To achieve successful foreign collaboration and UAV production for BAF requires an institutional framework. Present UAV initiatives are fragmented across different forces and lack centralized leadership. Centralized leadership is critical for aligning UAV projects with national goals (Sarkeer, 2025). BAF AEDC's current UAV projects (KX-2, NFX, DFX) demonstrate progress but require centralized oversight to align with national goals (Rahman, 2025). BAF needs to establish specialized units, such as the proposed Defence Technology Transfer & JV Coordination Cell, which the Ministry of Defence (MOD) and Ministry of Foreign Affairs (MOFA) jointly manage. This unit will act as a single window for all foreign collaboration agreements, conduct due diligence on technology compatibility, intellectual property protection, and licensing, and

maintain a centralized database of all ToT and JV agreements. This coordination cell will monitor project timelines and coordinate across ministries and BAF for large-scale UAV programs. This will help streamline processes and technology adoption. BAF must strengthen its technical and R&D system. This will help absorb foreign technology. It will also support co-development of UAV platforms through ToT and JVs. BAF has demonstrated initial capability through ARDC and prototype UAVs, but there remains a gap in advanced infrastructure, skilled manpower, and design validation capabilities. Türkiyes' development of UAVs initially began with foreign procurement and moved to ToT. Thereafter, Türkiye achieved self-reliance and export potential (Düz, 2020). BAF can prioritize ToT in the short term while preparing for indigenous innovation in the long term. The example of Pakistan's Shahpar-II UAV program demonstrates how a state can shift from heavy reliance on foreign suppliers to developing an indigenous defense production capability. Pakistan's domestic defense industry first started structured joint development with foreign partners. Joint development and gradual indigenization allowed Pakistan to customize UAVs, integrate payloads, and deploy them independently (Jalil, 2022). This case shows how ToT can serve as a stepping stone. This reduces long-term dependency and also fosters local expertise, supply chains, and innovation capacity. The lack of certified testing and simulation tools has limited BAF's ability to validate UAV performance prior to flight testing. Trial-and-error prototyping persists due to inadequate testing facilities (Sayeed, 2025). ARDC's projects, such as the PFX VTOL, demonstrate the need for wind tunnels and simulators (Rahman, 2025). Pakistan's UAV flight-test capability, supported by testing and maintenance infrastructure, enables independent UAV operations. BAF needs to establish a UAV Systems Integration and Validation Center with wind tunnels, flight simulators, software testing bays, and environmental chambers. The facility also needs to be co-located with ARDC for R&D synergy. The wind tunnels and simulator testing capabilities must align with ToT agreements to enable effective co-

development with foreign firms. Officers of BAF have academic qualifications but lack hands-on training in UAV systems engineering, avionics design, and control algorithms (Islam, 2025). BAF engineers and technicians need practical skills in avionics and propulsion systems, as they lack expertise in advanced subsystems and specialized training (Nayem, 2025). Exchange training programs with countries of UAV developers, such as Türkiye, China, or Europe, under structured ToT frameworks will strengthen technical capacity. Effective ToT and JV frameworks in the defence sector can be operationalized with a conducive legal and policy environment. A comprehensive defense industrial policy needs to be created, with a dedicated chapter on unmanned systems. It should offer incentives for foreign investment and local co-production. Achieving UAV self-reliance through ToT and JVs requires more than technical capability and legal readiness. It also demands flexible, transparent, and strategic financial and procurement systems. Current defence procurement policies in BAF are import oriented and unsuitable for co-development models. Key reforms are needed for efficient resource allocation. The procurement system in BAF must support UAV innovation and collaboration. BAF may plan to encourage private-sector participation in defence production and also partnership with foreign Original Equipment Manufacturer (OEM). The current defence budget is manpower-focused, while BAF spends most of its funds on equipment purchases. A priority-based budget system is needed for BAF to achieve operational effectiveness. Now, BAF is close to signing a ToT agreement with a Chinese company for UAV development. BAF has built several UAV prototypes to develop indigenous capacity aligned with operational needs (Khan, 2025). This effort helps to create foundational infrastructure. It also builds the human capital required for sustained indigenous UAV development. UAV R&D in BAF is funded through a fixed budget with little connection to performance or scalability. The current defence procurement system focuses on buying complete systems. It is not suited for iterative development or co-production. Pakistan's Shahpar-II

Unmanned Combat Aerial Vehicle (UCAV) program, developed by Global Industrial & Defence Solutions (GIDS), demonstrates how limited ToT and capacity-building can strengthen national security.

Autonomous production and deployment enhanced Pakistan's operational readiness (Jalil, 2022). Pakistan integrated local R&D with technology transfer through the Shahpar and Burraq programs. Pakistan became the fourth country to deploy UCAVs in active operations. BAF may follow this model by building internal capacity while using ToT. This approach would produce vulnerability to arms embargoes. It could also position Bangladesh as a future exporter of UAVs (Jalil, 2022). The Bayraktar TB2 program drove Türkiye's transformation from a UAV importer to a global exporter. Baykar Technologies developed it with strong support from the Turkish government and military. The Bayraktar TB2 became the backbone of Türkiye's UAV fleet and has been exported to over 30 countries. Pakistan's experience shows how G2G arrangements can streamline ToT and reduce commercial risks. Direct state-level engagement between Pakistan and Türkiey accelerated deployment and ensured sustained technical support. This validates the model for BAF's future partnerships. Türkiye also strengthened domestic capabilities while practicing technology diplomacy. It built trust-based defence ties with Africa, Central Asia, and Europe (Akan, 2023). For Bangladesh, ARDC can also be a robust research center for UAVs.

Recommendations

Based on the research findings, the following recommendations are made:

- Establish a Dedicated UAV Directorate at Air Headquarters to centralize all UAV-related activities, including a Defence Technology Transfer & Joint Venture (ToT/JV) Coordination cell to streamline inter-agency collaboration.

- Enact a UAV Regulatory Act that clearly defines UAV categories and intellectual property rights. Outcome-based budgeting for UAV projects and a single-window clearance system under the MoD need to be introduced.

- Develop a UAV System Integration & Validation Center equipped with wind tunnels, simulators, and environmental testing facilities. Initially start with G2G agreements with Türkiye or China for ToT and JVs for localized co-production.

- Embed foreign mentors in ARDC teams and institutionalize exchange programs with global OEMs to strengthen technical expertise in propulsion, avionics, and flight control systems.

Conclusion

This research has systematically evaluated the role of ToT and JV in the BAF's indigenous UAV production capabilities. This study provides a comprehensive framework for achieving self-reliance in UAV manufacturing, analyzes the current state of UAV development, identifies systemic challenges, and draws lessons from global models. The findings highlight the requirement for clear policies, institutional reforms, and international collaboration. To achieve technological self-reliance in the UAV sector, there is no alternative but to strengthen innovation and reduce reliance on foreign suppliers. The recommendations in this chapter are intended to assist policymakers and defence planners in transforming BAF's UAV sector into a robust pillar of national security and technological sovereignty. Modern warfare is changing rapidly and increasingly relies on UAVs for reconnaissance, surveillance, and tactical operations. As such, BAF's dependence on foreign procurement presents significant strategic vulnerabilities. The study reveals that BAF has made notable progress in UAV development through initiatives such as the KX-2, NFX-2, and DFX-1 prototypes, and has demonstrated foundational technical competence. However,

these initiatives are still confined to the prototype stage and have not progressed to operational development or mass production. The establishment of the ARDC represents a strategic shift toward self-reliance, but its capabilities remain limited in design validation, advanced manufacturing, and avionic integration. The pursuit of UAV self-reliance is not only a strategic necessity for the BAF. It is a national imperative for defence modernization, industrial growth, and technological sovereignty. BAF needs to pursue structured foreign collaboration, implement strong policy reforms, and increase investment in resources. BAF can transition from dependency to innovation and ensure operational readiness in the face of evolving threats by following the recommendations provided in this report. A well-coordinated approach integrating ToT, JV, Policy coherence, and industrial capability will empower the BAF and Bangladesh to leap from experimentation to sustainable UAV production and strategic autonomy.

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QUEST FOR CREDIBLE DETERRENCE: OPTIONS FOR BANGLADESH ARMY

Colonel G M Shamsuzzaman, afwc, psc

Introduction

Bangladesh (BD) has made consistent economic progress over the past decade and hopes to become a developed nation. Its strategic location along the Bay of Bengal provides a plethora of opportunities. In the last 54 years, BD has become increasingly prominent in all fields of national power. The existence and development of BD are highly dependent on a secure and peaceful regional environment. BD promotes a peaceful and stable region in the interest of its national security, given its expanding economy and its transition to middle-income status. A strong military power is essential to protect the territorial integrity and sustain national security. BD is a peace-loving, geographically small country. BD's foreign policy aims to strengthen diplomatic relations with its neighbors. Therefore, BD shall take all possible measures to avoid initiating or becoming involved in a conflict unless forced to do so. BD promotes 'security through development.' Instead of relying solely on military action, it is possible to defend national interests through a combination of diplomacy, power projection, and military means. Therefore, BD's Defence Policy is fundamentally based on three pillars; Defence Diplomacy, Deterrence and Defeating a Hostile Design.

The second pillar of deterrence aims to prevent an action by making it costly or difficult to succeed, thereby undermining a potential aggressor's confidence in achieving its goals. The BD Army is responsible for safeguarding the country's sovereignty and territorial integrity. However, the existing defensive posture is insufficient to

provide credible deterrence to its neighbors. To safeguard the country's sovereignty and territorial integrity against external threats, the BD Army needs to achieve credible deterrence. The BD Army's operational approach begins with activities aimed at achieving effective deployment and deterrence, thereby creating favorable conditions for subsequent phases. The question is whether the Deployment & Deterrence Phase can impose sufficient deterrence on potential threats through mere deployment. The most likely response is that the BD Army has yet to develop a cohesive deterrence strategy. The obvious question that follows is, "Is the adoption of the BD Army's Operation Plan's 'Deployment & Deterrence Phase' justified in light of the BD Army's capability?" The ultimate response to the question of "How can the Bangladesh Army pose a genuine deterrence to the possible threat?" must be discovered to resolve the problem. This paper shall discover viable deterrence options for the BD Army.

Understanding Deterrence

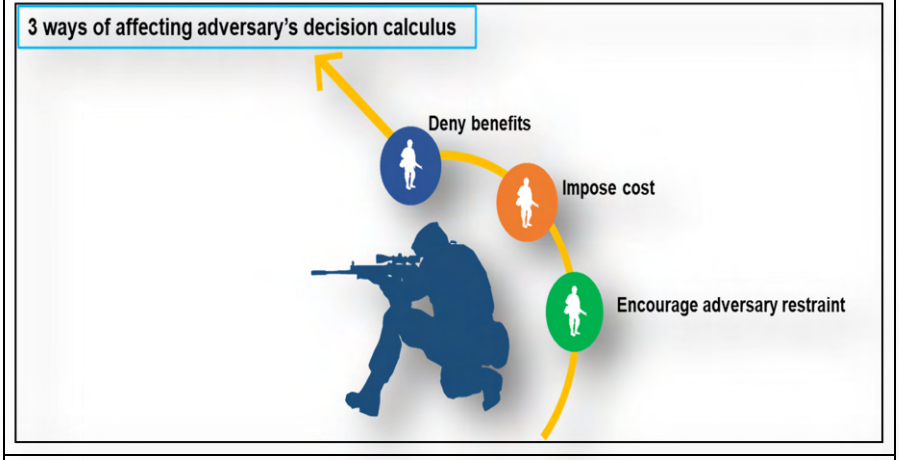
Deterrence is old. As old as war itself. However, it still confuses people – scholars included. Books have been written, doctrines built, wars fought around it. However, its efficacy is unclear because most instances of deterrence are usually unseen. When it succeeds, nothing happens. No invasion, no attack, no war. Just silence. Silence does not make it into the history books. After World War II, nuclear weapons changed everything. Suddenly deterrence was not just a military concept – it became the foundation of how states kept each other in check. The idea spread beyond superpowers too. Nagorno-Karabakh, Ukraine – Russia, US-Israel war on Iran – all show what happens when deterrence holds, and what happens when it does not. A credible deterrent can push rivals toward negotiation. Lose that credibility, and the path to peaceful resolution gets a lot narrower. Moreover, here is something people overlook – deterrence is often built during peacetime, long before any conflict starts.

Defining Deterrence

Nobody has ever agreed on one specific definition. Military doctrine, academic papers, and strategic studies – all keep it vague on purpose. There is no uniform approach to effectively deterring an adversary. North Atlantic Treaty Organization (NATO) defines deterrence as "the threat of force to dissuade an opponent from carrying out an aggressive action against one's own country or nation-state." This can be achieved through the threat of retaliation (deterrence by punishment) or by denying the opponent's war aims (deterrence by denial). Oxford Online Dictionary defines deterrence as "the fact of making somebody less likely to do something."

Thus, considering the essence of all definitions this paper defines deterrence, as "Deterrence is the method of trying to avoid war by persuading potential adversaries decision-making process that the benefits of taking aggressive action would not outweigh the costs and risks involved." The method of winning without fighting is deterrence. It is intertwined with Sun Tzu dictum "the supreme art of war is subduing the enemy without fighting." This is the "end" or goal of BD Army to achieve deterrence.

Figure 1: Ways of Affecting Adversary's Decision Calculus



Source: Writer's Construct

Common Distinctions of Deterrence

Table 1: Deterrence by Denial and Deterrence by Punishment	
Deterrence by Denial	**Deterrence by Punishment**
Denial is defensive. It can be based on "the ability to physically deter an aggressor from achieving their goals due to resistance and the enormous cost of war." Denying means can include positioning a sizable military force squarely in the path of an invader and speaking loudly and clearly. **Costs > Benefits** Taiwan and the People's Republic of China are the most relevant examples of this concept's application.	Punishment is offensive. Deterrence through punishment can be achieved by threatening a swift response. The threat must be credible and have enough fatal potential to be carried out. Nuclear deterrence underpinned the East-West standoff during the Cold War.
Source: Writer's Construct	

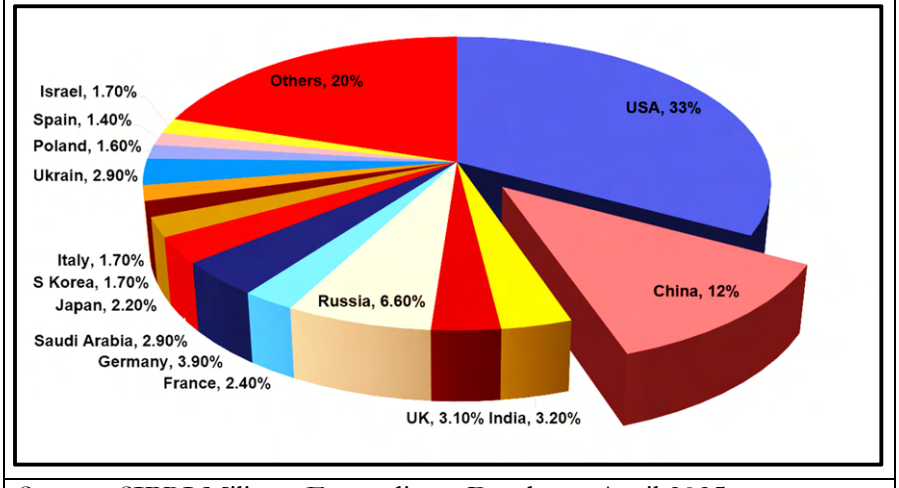
Table 2: Direct Deterrence and Extended Deterrence	
Direct Deterrence	**Extended Deterrence**
An endeavour by a state to prevent attacks on its territory is direct deterrence. A prime example of direct deterrence is the nuclear capability of Pakistan and India.	Extended deterrence occurs when a state provides security to an ally or partner that is under threat. One of the most famous examples of this was when the US provided security to South Korea against threats from North Korea.
Source: Writer's Construct	

Table 3: Immediate Deterrence and General Deterrence	
Immediate Deterrence	**General Deterrence**
Immediate deterrence refers to quick attempts to prevent an impending attack. For instance, the US 7th Fleet's presence in the Bay of Bengal in 1971.	In a non-crisis situation, General Deterrence is present when there appears to be no immediate threat; however, a state still views a possible threat of force from a different state as a valid concern. An example would be the continued military assistance from the United States to Israel.
Source: Writer's Construct	

Importance of Deterrence Strategy for Bangladesh Army

The world has progressed far beyond imagination. With the changing world order and advances in technology, warfighting has become a complex affair. According to the latest Global Peace Index, the world is becoming less peaceful due to ongoing tensions between countries. The world is experiencing the development of technology related to space, cyberspace, artificial intelligence, and autonomous weapon systems every day. Global defence expenditure crossed $2.887 trillion for the first time in 2025.

Figure 2: World Military Expenditure of the 15 Countries



Source: SIPRI Military Expenditure Database, April 2025

BD is a key strategic player in the region. It wisely fosters strategic partnerships with other nations in the region. BD is at a critical juncture as the geopolitical environment in the Indo-Pacific region changes dramatically due to the conflict in Ukraine. Security is a major issue in BD and other South Asian countries. BD has several unresolved issues with its neighbors. Border disputes, water sharing of international rivers, Forcibly Displaced Myanmar Nationals (FDMN), repeated airspace violations, and troop mobilization in the bordering areas are common causes of conflict, which may escalate into war. BD strongly believes that conflict resolution through diplomacy and negotiation is preferable than going to war and should be avoided at all costs. At a Darbar on April 12, 2026, the Honorable Prime Minister Tarique Rahman instructed the armed forces to protect the nation's sovereignty. On the same day, the prime minister committed to continued government support for improving the military's capabilities and modernization. Since its inception, the Bangladesh Army has undergone expansion and modernization in all respects.

BD Army is not an expeditionary force. It is not going to invade any country. However, BD would like to avoid any internal or external threats from potential adversaries to safeguard its sovereignty and promote and protect the country's growing economy. Having a very strong military power is an option for us to deter any invader. However, our economy will not permit us to prepare a military power of such a size. To keep the peace and maintain stability, BD must adopt a deterrent posture to deter threats to its territorial integrity and economic growth.

The "Theory of Deterrence" is an important aspect of this process because it can protect a smaller nation like BD. The most effective method of deterrence is denial; it makes it difficult and costly for an aggressor to fight. BD can also implement deterrence through punishment. The tools of deterrence must be credible, capable, and communicable. However, due to its lack of allies, BD must have a strong

ally to provide alternatives, such as adopting a general and extended deterrent posture. Since BD is not an ally, it can establish a passive alliance through military acquisitions and joint training exercises. Modern warfare has changed significantly as a result of coherent deterrence strategies. Israel's Strategy of Deterrence is a vivid example. Deterrence has been a significant component of Israel's security strategy ever since the creation of the state. BD Army should have a credible deterrence force that has latent violence built in and punitive power.

Deterrence Options for BD Army

The BD Army should maintain a minimum credible deterrence at all times. Simply deploying and concentrating forces will not be enough to achieve the goal of the "Deployment & Deterrence" phase. Deterrence strategy options available for the BD Army are appended below:

Making the War more Expensive for a Strong Adversary through Total People's War

Winning a war against a numerically and technologically superior enemy is always possible, provided we imbue the country's population with a 'deep sense of patriotism'. Leverage the nation's vast population. Integrate them into the warfighting capacity. History is replete with such examples. The 1971 Liberation War, the Vietnam War of 1954, and the Chinese People's War of 1949 – these are not just history lessons. They are the playbook. In every case, a smaller force refused to fight on the enemy's terms. To prepare for war against a force overwhelmingly superior to us in all respects, merely preparing the Conventional Forces will not be enough. Most of the wars fought by weaker nations against a superior enemy tried to invigorate the moral strength of the nation because "physical forces are the 'wooden hilt', but moral forces are the 'shining blade' of the sword – as Clausewitz defines. The huge demographic strength of BD can be easily integrated into the country's overall war effort to enhance its fighting power and offset the limitations of its lesser geographic depth. Potential adversaries need to think twice

before invading since the entire nation of BD will be involved in the conflict. BD Army published 'Operations of War (GSTP-0032) Volume One' in 2006. The doctrine states that BD may have to resort to Total People's War after its conventional power diminishes.

Effective Implementation of Existing Unconventional Warfare (UCW) Concept

The Draft Doctrine suggests that conventional and unconventional strategies must be conducted simultaneously as soon as hostilities begin. The objective of both forms of warfare is to work together to achieve a synergistic effect. However, the concept needs to be revisited in light of current realities. Army Training and Doctrine Command (ARTDOC) should finalise the concept, strategy, and tactics. UCW doctrine should be finalized and materialized in a true sense as a unique concept. Existing UCW doctrine must be practiced during Winter and Summer Training. UCW force would be employed to engage the enemy in length and breadth from all directions with varied dimensions. The enemy should be challenged at every moment while she walks inside our territory. The crisis must be created over and over again so that the enemy is induced to take action detrimental to his interests. Each member should be turned into a 'fighting machine' to fight outnumbered. It should be in terms of quality, training, equipment, and decision-making. To make the unconventional force autonomous, they should be equipped with RPGs, shoulder-fired missiles, handheld rocket launchers, and communication equipment. Some of the groups would operate across the border to engage high-value targets. Their motto would be:

- Fight around the enemy's strength.
- Not to fight from a static position.
- Avoid the strong, attack the weak – attack and withdrawal.
- Strike only when success will be assured.
- Keep the enemy constantly alert at the front and the rear.

UCW forces' weapons and ammunition supply will be calculated in detail by divisions. A demand has to be placed with Army headquarters. Divisions will collect and store them so that they can be distributed to the unconventional forces appropriately in times of need. The UCW will live off the land for rations and perishables, as these people will be recruited from their locality and will likely operate in that area. However, unconventional forces will get a subsistence allowance for local procurements.

The Defensive Strategy should be Redefined by Integrating an Offensive Posture

Winning a war against a numerically and technologically superior enemy is always possible, provided we are imbued with an offensive spirit and a strong will to win even with our limited capacity. History is replete with such examples. The most glaring examples are those of Vietnam, Afghanistan, and Iran. To safeguard the country's sovereignty and territorial integrity against external threats, the BD Army needs to analyze further and redefine its current strategies. Doctrine does not signify whether it is defensive or offensive. Instead, posture may be defensive or offensive. Posture may be of four types: defensive defensive, offensive defense, defensive offensive, or offensive offensive. The military strategist may adopt the required posture. We have a Principle of War- "Aggressive Action" which dictates that we undertake offensive strategies. BD defense policy also focuses on 'establishing a firm defense posture convertible to offensive according to the dictated situation'. Besides, BD's current doctrine insists on using a "limited offensive" as a form of offensive defense. In defensive campaigns and battles, no effort should be spared to wrest the initiative from the attacker at every stage and deliver decisive blows when opportunities arise.

The idea is simple – do not just absorb the attack; make the attacker bleed for every step. Shape the battlefield your way. Hit their timetable. Keep generating crises faster than they can respond. The crisis must be

created repeatedly so that, by the time the enemy reacts to one, another occurs. Offensive defence is not a tactic. It is a mindset. The moment an enemy crosses into Bangladesh territory, they should feel it. Constant pressure, no breathing space. An aggressive posture from day one will not only threaten the enemy but also serve as a deterrent. BD Army needs a force specifically designed to operate offensively within the broader defense framework. Defence does not mean passive. In addition, the existing doctrinal concept of a 'limited offensive' across the international border may be launched at the start of hostilities to compel the potential foe to engage in a multi-front battle. We should remember that snakes also bite offensively in self-defense when confined in space.

Drones will Completely Change Future Warfare

Drones quickly made traditional war tactics useless. Modern, sophisticated drones are redefining the rules of engagement on battlefields around the world. The modern battlefield has become transparent. Surveillance technology means there is nowhere to hide. The Nagorno-Karabakh and US-Israel war on Iran conflict shows that BD does not necessarily need expensive heavy weapons to tilt battlefield odds in our favor. To face future challenges, the BD Army should prioritize deploying drones, particularly in the southeastern sector. The induction of drones will create significant deterrence for adversaries. The capability is straightforward – find the target, fix it, track it, hit it. Fortifications, radar, SAMs, armor – drones handle all of it. Libya, Syria, Nagorno-Karabakh, and the US-Israel war on Iran all proved this. The Bayraktar TB2 may be integrated into the Army. The Turkish-made Bayraktar TB2 has a 150 km range and 24 hours' endurance, making it highly cost-effective and combat-proven.

Integration of Long-Range Weapon (LRW)

The LRW system is an essential component of every modern Army for fighting the enemy from a distance. It is the principal contributor to the

application of firepower. BD has already taken a good step by bringing in Turkish MLRS. However, that is a start, not a finish. LRW should adopt strategy-led technology, not technology-driven military strategy. The existing artillery is behind in range, mobility, protection, ammunition, and flexibility. Bangladesh's terrain demands land-based systems capable of punching across borders if needed. Three systems worth serious consideration: Turkish Khan at 500 km range, Russian OTR-21 Tochka also at 500 km, and the American M270 MLRS at 300 km. Any of these changes the equation. An adversary planning an invasion has to now account for strikes deep inside their own territory. That changes calculations fast.

Strengthening Land Forces Cooperation

Strong regional and global defense ties are no longer optional. They are part of the deterrence architecture itself. All stakeholders have an interest in the region's stability. Defence relations can be enhanced through senior leader visits, joint exercises and war-games. These build trust and interoperability. In the last decade, the BD Army has participated in field training exercises with many nations worldwide. In another dimension, technological assistance, intelligence sharing, and cyber security augmentation can enhance our collective ability to address the challenges posed by evolving threats. Threats today do not just come in tanks. They come through networks, disinformation, and hybrid tactics. Meeting that requires partners, not just weapons. Recently, the BD Army has co-hosted the 46th Indo-Pacific Armies Management Seminar (IPAMS). IPAMS has always played a significant role in fostering peace and stability by building friendship among armies of the Indo-Pacific region. Land Forces cooperation is essential for building long-term regional and international security. BD Army is a major player in global peacekeeping and multinational efforts to maintain international security. BD shall always assist the global community in maintaining peace and order under the UN Charter. BD's participation in such activities helps to increase our security and stability.

Conclusion

BD has reached a new height as a result of growing economic emancipation. The growing economy and social progress will open the door for joining the club of developed nations by 2041. Given prevailing geopolitical and security conditions, BD is likely to face security challenges from potential adversaries. Thus, BD must use all of its national powers to protect the progressive economy, sovereignty, and territorial integrity. The BD Army is responsible for safeguarding the country's sovereignty and territorial integrity. The Army is employed by the state not only to maintain its territorial integrity but also to safeguard its foreign policy and interests.

A Soldier has to learn how to fight and win a war. A General has to learn how not to fight a war. The goal of deterrence is to avoid war. Most scholars agree that deterrence by denial is the most effective strategy for preventing war. It is always challenging for the weaker to deter the stronger. However, it is not impossible, as evidenced by the cases of Iran and Taiwan. Land Force should develop itself into a credible deterrent to potential adversaries. Deterrence is all about perception. As such, the BD Army should have the intangible capability to project sharpened teeth to a potential adversary. This study has brought to light many deterrence options that are well within the BD Army's affordability. It is the only intent and approach with which the BD Army can orchestrate a coherent deterrence strategy.

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