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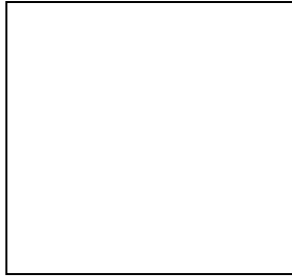
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FOREWORD



As the Commandant of the Defence Services Command and Staff College (DSCSC), it is both a privilege and honour to present the 10th Volume of the Defence and Security Journal - 2025. Symbolising a decade of scholarly excellence, this milestone edition reflects our enduring commitment to fostering intellectual discourse and advancing the body of knowledge in defence, security, and strategic studies.

The theme of this year's edition, "Developing Comprehensive National Security Landscape," resonates profoundly with the evolving security paradigm confronting nations today. In an age where traditional threats intertwine with non-traditional challenges ranging from geopolitical competition and transnational crime to cyber, environmental, and informational domains, national security demands a comprehensive, integrated, and multidimensional approach.

Within this context, the Defence and Security Journal continues to serve as a distinguished platform for our Faculty, Course Participants and scholarly contributors to articulate ideas, share research findings and critically examine the dynamics shaping contemporary and future security environments. The articles featured herein encompass diverse perspectives, strategic, operational and analytical, offering valuable insights into the complexities of modern defence and security affairs.

As we celebrate this 10th volume, it is fitting to acknowledge the academic perseverance, intellectual curiosity and professional dedication that have sustained this journal over the years. I extend my sincere appreciation to all authors for their thoughtful contributions and to the Editorial Board for their meticulous efforts in curating this edition to the highest academic standards.

As you engage with the ideas presented in these pages, I invite you to reflect upon their implications for our national security and to draw inspiration for innovative and pragmatic solutions. Together, through continuous intellectual engagement and strategic foresight, we can contribute to shaping a secure, stable and prosperous future for Sri Lanka.

HHKSS HEWAGE RWP, RSP, USP, rcds, psc

Major General

Commandant

Defence Services Command and Staff College, Sri Lanka

STRATEGIC IMPERATIVES: ESTABLISHING A SPECIAL MOUNTAIN OPERATION TEAM FOR ENHANCED SECURITY IN CENTRAL UP-COUNTRY REGION

Major BMHM Samarasinghe psc CR

ABSTRACT

Sri Lanka, located in the heart of the Indian Ocean, holds significant geopolitical importance, making it vulnerable to diverse security threats. Its national security concerns stem largely from its strategic location, necessitating robust policies to protect political, economic, social, environmental and military interests of which military security is paramount. Effective force deployment, especially in geographically sensitive areas like mountainous regions, requires specialised knowledge, tactics and preparedness. However, the Sri Lankan Armed Forces currently lack a strong focus on mountain warfare. This research examines the necessity of establishing Special Mountain Operation Teams in the Central Up-Country Region. It draws from primary and secondary sources, including academic literature, official documents and interviews with military and academic experts. Finally, the study aims to inform future training and operational planning for mountain warfare.

Keywords: Sri Lanka, Mountain Warfare, Central Up-country Region, National Security, Sri Lankan Armed Forces

1. INTRODUCTION

The total land mass of Sri Lanka is 65,610 km² which is mainly divided into 3 zones as coastal plain up to 30 m above mean sea level, intermediate plain from 30 m to 300 m above mean sea level and central highlands over 300 m above mean sea level. According to the UNESCO World Heritage Centre, Sri Lanka's central highlands cover approximately one-third of the country's total land area, which would be roughly 21,870 km². Accordingly, Central Up-Country Region (CUCR) of Sri Lanka also bears a considerable portion of land out of the total land mass of Sri Lanka. However, there is a lack of research on enhanced security in the CUCR of Sri Lanka, which has a significant effect on the national security of the country. Therefore, this study aims to

explore the necessity of establishing Special Mountain Operation Team (SMOT) in the CUCR of Sri Lanka. The findings of this study will contribute to understanding the contemporary security threats in the CUCR and the skills and equipment that are required to maintain a formidable military force in order to face future threats. When considering the mountainous terrain in the world, the term “Mountain Warfare” (MW) is always bonded with military forces. MW refers to warfare in the mountains or similarly rough terrain. This terrain can be comprised of rocks, cliffs, mountains, snow or glaciers. At times, troops may have to conduct military or non-military operations in such terrains. MW is one of the most dangerous types of combat, as it involves surviving not only combating with the enemy but also the extreme weather and rugged terrain.

The research objectives focused on assessing the current security situation in the CUCR, considering both internal and external threats, examining the historical context and security challenges faced by the region, highlighting any unique characteristics that necessitate specialised attention, evaluating the existing capabilities of the Sri Lankan Armed Forces and identifying gaps in the current training curriculum and infrastructure and proposing a framework for the establishment of an SMOT within the Sri Lanka Army (SLA), detailing the required training and equipment. The problem statement addresses the raising threats and economic significance of the CUCR, which is totally different terrain compared to other areas of the country, demands military forces be equipped and develop their skills and knowledge to operate in such a nature, whereas the Sri Lankan Armed Forces don't have as much experience as other areas of the country. The core argument asserts that establishing a SMOT is essential to address the unique security challenges posed by the CUCR's difficult terrain, evolving security threats and the limitations of existing forces.

Key research questions focus on specific security threats and challenges, unique characteristics in mountain region, current capabilities and limitations of the existing security forces and necessary training, equipment and resource requirements for establishing and sustaining a SMOT. Further, the significance of the study primarily lies in operational effectiveness. Establishing a SMOT is tailored to the CUCR's specific demands, which can improve the effectiveness and efficiency of security operations in the area. This could include quick response to emerging threats, undertaking specialised missions and exploiting advanced tactics and technologies. Moreover, the study's scope encompasses on geography of the CUCR of Sri Lanka, which is characterised by its hilly terrain, dense forests and diverse population, presenting unique security challenges. Access to sensitive information, time and personnel available for data collection, security concerns and logistical challenges and language barriers were the limitations for the researcher during the study and some of the military documents of foreign armies were restricted to access.

This study explored, a wide range of primary and secondary data, including academic journals, official government documents and interviews with current and former members of the SLA and academia in the field of defence and history. The study was guided by a combination of qualitative and quantitative research designs and the results have been analysed using thematic and descriptive statistical analysis. The findings of this research are expected to contribute to the growing body of knowledge about training and employing special operation teams in CUCR.

2. METHODOLOGY

The pragmatism research philosophy was followed here, which is a philosophical tradition that developed in the late 19th century. It highlights the real-world implementation of ideas and the use of empirical methods to examine theories and concepts (William J, 2004). The abduction approach was conducted to integrate both induction and deduction together. It starts with an incomplete set of observations and proceeds to the possible explanation for the group of observations. Interviews and survey techniques were chosen for this study because they allow the researcher to explore the perspectives of key stakeholders and to test conceptual framework about security capabilities and limitations by conducting surveys on selected sample to gather broad-based data. The study focused multiple method combining qualitative and quantitative data which were collected through open ended questionnaire, unstructured interviews and from a survey. The data have been collected over a period of four months (March-August 2024). Hence, the cross-sectional time horizon was used by the researcher. Primary data was collected through unstructured interviews conducted with the selected participants and a survey among the selected sample by close-ended questionnaire. Moreover, secondary data for the research was collected through the examination of previous research articles, theses, military doctrines and books. Thematic analysis, a qualitative data analysis technique and SPSS, a quantitative data analysis technique, were used as the analytical framework for this research.

2.1 Conceptualization

The conceptual framework has been formulated based on the theoretical framework as follows:

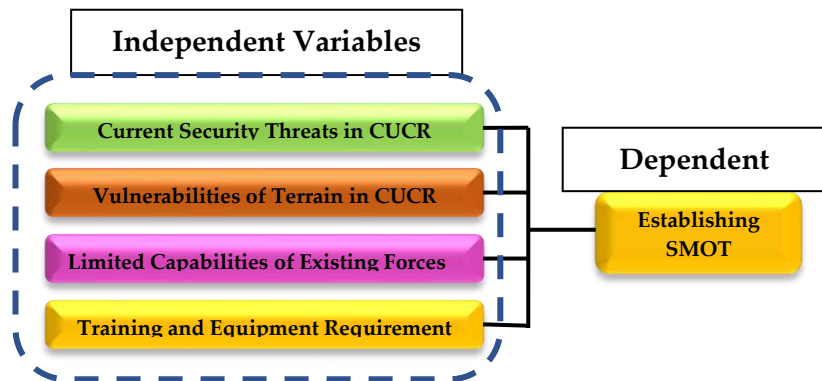


Figure 1: Conceptual Framework

Source: (Authors, 2024)

3. MOUNTAIN WARFARE AND ITS CHARACTERISTICS

Mountain Warfare is regarded as fighting in terrain with elevation differentials of at least 300 m and additional characteristics, such as complex and rugged terrain, low temperatures or challenging altitude (Lechner, Küpper and Tannheimer, 2018). According to Sharma et al. (2023) High altitude climatology refers to the diversity of elevation ranges, verticality, topography steepness, relative relief, steepness and other qualities such as tree line, snowline, glacial limits and their relationship to temperature and vertical drop in atmospheric density. Moreover, as per the US Marine and Army MW doctrine, Mountains can rise fast from the plains, forming a tremendous barrier or gradually, as a series of parallel hills that run unbroken for many kilometres. They can feature isolated summits, rounded crests, eroded ridges, high plains, valleys, gorges and deep ravines. Whatever their appearance, all mountains share challenging terrain (US Department of the Army, 2000).

Mountain combat is often close in nature as the opposing forces meet in the rugged terrain, the terrain commonly does not support the meeting and manoeuvre of large units, the ruggedness of mountain terrain often restricts mobility for foot movements using file type formations on roads and trails, sustainment in a mountain environment is a challenging and time-consuming process and the populace lives in typical mountain environments live mostly in small villages in the valleys with some scattered villages in the upper mountain areas. Research on counterinsurgency in mountain areas by Callan (2017) emphasises the difficulties of maintaining communication, logistics and information collection in isolated situations. According to most of the scholars'

views, it is highlighted that operating in mountainous terrain is much more difficult than other terrains due to its special character and the fact that it requires different skills and equipment to operate effectively. As a result, mountains are home to many of the world's insurgents and terrorists.

The main concept of terrain-related conflict research is that mountainous regions build insurgency as an organisational form of conflict (Fearon and Laitin, 2001). Further, Fearon and Laitin (2003) found that, controlling for political and economic factors, a country that is "half mountainous" (90th percentile of their sample) has a 13.2% risk of experiencing civil war. Further, they found that a similar country that is not mountainous should expect a 6.5% risk of major armed conflict. Similarly, recent research has been found that mountainous terrain is associated with proportionally more terrorist attacks (Nemeth, Mauslein and Stapley 2014)

4. STRATEGIC IMPORTANCE OF CENTRAL UP-COUNTRY REGION

Due to its economic, political, topographical and cultural significance, the CUCR of Sri Lanka holds significant strategic value. Sri Lanka is an island made for tea. As per the Tea Industry Capability Report 2021 by the Sri Lanka Export Development Board, the country produces tea throughout the year and the total tea production is about 340 million kilogrammes per annum (Lanka, 2022). The tea exports account for about 11% of the total exports and about 38% contribute to the total agriculture exports in the country, which is around 1.6% of GDP in 2018. The tea sector is expected to achieve the export target of US\$ 2,044 million in 2025 (Lanka, 2022). When considering both the annual report of the Sri Lanka Tea Board and the Tea Industry Capability Report 2021 by the Sri Lanka Export Development Board, the CUCR contributes significantly to the country's economy by means of producing a considerable amount of tea and exporting it to the world market.

According to the reports of Ministry of Irrigation and Mahaweli Authority (2023), this region is home to many economically valued hydroelectric power stations, dams and reservoirs. In addition, tourism plays a vital role in CUCR as a main contributor to the total GDP of the country. It was around 11.6% of total GDP in 2017. Kandy, Nuwara Eliya, Ella, Haputhale, Hortan Plains, Adam's Peak and Knuckles Range are the most popular travel destinations in CUCR according to the report by the Sri Lanka tourism development authority

The formation and growth of political parties is a relatively new trend in CUCR, especially in Sri Lanka's plantation community, in which trade unions predate political organisations. The unionisation of plantation workers began in the 1930s (Ramesh, 2023). According to Ramesh (2023), most of the political parties in Sri Lanka's plantation community have the unique attribute of being organised as trade unions and parties at the same time. The Ceylon Workers Congress (CWC), Democratic Workers Congress (DWC) and National Union of Workers (NUW) exemplified this dual character of the political parties in the plantation community.

The CUCR of Sri Lanka is culturally significant due to its varied traditions, ethnic diversity and rich historical background. As per the Department of Census and Statistics, there are few ethnic and religious groups living in this region.

5. SPECIAL TACTICS AND TECHNIQUES USED BY POWERFUL ARMIES

According to (Lechner, Küpper and Tannheimer, 2018), movement and manoeuvre, fire, sustainment, intelligence, command and control and force protection are critical in mountain terrains.

As US Army training doctrine describes, in preparation for combat, commanders should consider the following list of specialised operations, procedures and techniques that may be required for successful operations in mountain terrains ('Infantry Small-Unit Mountain Operations February 2011 Headquarters, Department of the Army', 2011):

- a. Basic climbing techniques.
- b. Mountain navigation.
- c. Mountain stream crossing.
- d. Long-range angle firing techniques.
- e. Mountain terrain route selection.
- f. Off-road and steep-terrain driving.
- g. Use of ropes (fixed ropes, high lines and basic installations).
- h. Procedures to avoid landslides and avalanches.
- i. Use of animal transport for weapons and logistical items.
- j. Walking and movement techniques for steep and rough terrain.
- k. Cold weather movement.
- l. Mountain survival techniques.
- m. Hazardous cross-country night movement.
- n. Advanced first aid.
- o. Personal hygiene and field sanitation.
- p. Small unit immediate action drills.
- q. Rough terrain, steep earth casualty evacuation (CASEVAC).

6. FINDINGS AND DISCUSSION

Data gathered from interviews with experts in defence and history, including defence field professionals and academia, are presented and analysed methodically using the qualitative technique of thematic analysis. The data from the interviews were initially coded to capture key themes and patterns. Further, Thematic analysis examine the responses within each identified theme to improve understanding of the strategic imperatives and offer solid recommendations. The researcher identified four main themes and sub themes under each main theme after initial coding such as:

- a. Security Threats and Challenges.
- b. Unique Regional Characteristics.
- c. Existing Capabilities and Limitations of Security Forces.
- d. Requirements to Establish a SMOT.

An analysis of the quantitative data was conducted based on the data collected from a structured questionnaire that was given to senior military commanders and middle-grade officers from the Infantry, Commando and Special Forces Regiments of the SLA. The questionnaire was structured with 22 questions in order to get a variety of viewpoints from the selected sample. The data were processed using IBM SPSS statistics in order to uncover significant patterns, relationships and insights. This analysis provides a robust statistical foundation to support the research findings, offering a comprehensive understanding of the factors influencing military operations in the CUCR.

An ANOVA test was done to assess the statistical significance of the independent factors in predicting the demand for the establishment of a SMOT for enhancing security in the CUCR. The model shows a significant link between the independent and dependent variables, with a p-value of 0.000 ($F = 17.961$, $p < 0.05$). This illustrates that the combination of components such as current security threats in CUCR, vulnerabilities of terrain, limited capabilities of existing forces, equipment and training requirements significantly influence the development of a specialised operations team.

The Coefficient test (regression analysis) provides insights into how much each independent variable contributes to the perceived need for a SMOT. Key coefficients and their significance levels are:

- a. **Current Security Threats.** Coefficient = -0.042, $p = 0.538$ (not significant). This indicates that current security threats do not significantly impact the need for SMOT.
- b. **Vulnerabilities of Terrain.** Coefficient = 0.387, $p = 0.000$ (significant). The positive and significant coefficient shows that the more difficult the terrain, the stronger the perceived need for SMOT.
- c. **Limited Capabilities of Existing Forces.** Coefficient = 0.082, $p = 0.136$ (not significant). The effectiveness of the current security forces does not significantly affect the decision to establish SMOT.
- d. **Training and Equipment Requirement.** Coefficient = 0.226, $p = 0.001$ (statistically significant). This indicates that the need for specialized training significantly and positively affects the perceived necessity of SMOT. Coefficient = 0.150, $p = 0.025$ (statistically significant). The requirement for specialized equipment substantially enhances the apparent necessity for SMOT.

The researcher identified that the CUCR has considerable security challenges originating from its diverse topography, cultural variety and unique economic and infrastructure constraints. As per the analysis, existing security forces have great skills in different domains; nonetheless, inadequacies in training, equipment and coordination related to MW hinder their overall efficiency. Moreover, according to this analysis, there is a clear necessity for a SMOT equipped with sophisticated training, specific competencies and crucial logistical support. This will boost operational preparedness and adaptability to secure the CUCR efficiently.

The CUCR faces internal threats like insurgency, religious extremism, and social unrest, alongside external threats such as smuggling and foreign influence. Environmental challenges include harsh weather, dense forests, and landslides, while operational issues involve poor road access, language barriers, and weak intelligence. The area's complex cultural, economic and geographic landscape includes religious sites, plantations, hydropower infrastructure, and strategic peaks. Though existing forces have high morale and counter insurgency (COIN) experience, gaps remain in terrain knowledge, mountain operation training, equipment and coordination.

Advanced training and equipment, especially for infantry, are needed to match Special Operation Forces (SOF) capabilities in mountain operations and surveillance tasks.

Statistical analysis shows that current security threats in the CUCR do not significantly influence the need for a SMOT, likely due to limited awareness among participants. However, the region's demography is widely seen as a potential threat. Terrain vulnerability significantly affects the need for SMOT, as it poses logistical and manoeuvrability challenges. While existing force capabilities are not statistically significant, many participants acknowledge limitations in training, equipment, intelligence and terrain knowledge. The analysis confirms that the need for specialized training, equipment and a dedicated training institute with qualified instructors is critical for effective mountain operations.

According to research findings, SLA does not have any experience fighting in mountain terrain during COIN operation against LTTE since they did not operate in CUCR in Sri Lanka, whereas most of the operations took place in plains and intermediate plain areas. Therefore, the Sri Lankan Armed Forces focus on mountain operations were very limited, where the decision makers should address the root causes identified through in-depth analysis in the research. Based on the data analysed by the means of qualitative and quantitative, it is evident the argument made through the literature is in line with the research findings. Therefore, establishing a SMOT is essential to address the unique security challenges posed by the CUCR's difficult terrain, evolving security threats and the limitations of existing forces. By establishing such a team, the SLA can improve its operational effectiveness, enhance national security and better protect this strategically important region.

The findings of this research shed light on the strategic imperatives surrounding the establishment of a SMOT for enhanced security in Sri Lanka's CUCR. The analysis, based on both qualitative inputs from defence professionals and academia and quantitative data from military personnel, highlights critical factors influencing the necessity of SMOT as follows:

6.1 Current Security Threats

As per the qualitative study, there are potential internal and external threats in the CUCR, such as insurgent activities, religious extremism, social unrest, smuggling and the impact of foreign powers. However, as evidenced by the quantitative data, these security reasons were not viewed as the primary reason for establishing a SMOT. Instead, the focus shifted to the region's geographical and environmental concerns. This shows the communication gap within the organisation and lack of awareness of potential threats by the tactical level commanders.

6.2 Unique Regional Characteristics

The CUCR is characterised by its rugged terrain, diverse ethnic communities and major economic contributions, such as agriculture and tourism. These particular traits necessitate a specific approach to security. The qualitative data emphasised the significance for culturally sensitive operations and the protection of critical infrastructure, which aligns with the finding from quantitative analysis that terrain vulnerabilities are a crucial component in the establishment of a SMOT.

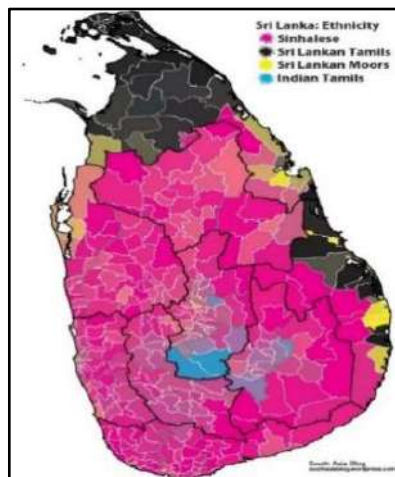


Figure 2: Sri Lanka Map of Population by Ethnicity and Districts, 2012
Source: Department of Census and Statistics (2012)

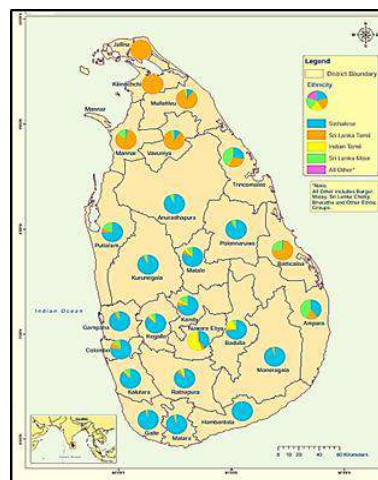


Figure 3: Distribution of Indian Tamil Population by District, 2012
Source: Department of Census and Statistics (2012)

6.3 Existing Capabilities and Limitations of Security Forces

The interviews revealed that, while the SOF are trained in basic MO tactics, their experience in mountain fighting and advanced training is lacking. Most of the participants have given answers with the morale that they have by defeating LTTE, not considering the existing capacity. This analysis supports the quantitative result that specialised training is a significant requirement. The lack of engagement with civil authorities and poor intelligence were also noted as important flaws that need to be addressed.

6.4 Requirements for Establishing a SMOT

Qualitative analysis emphasised the necessity for advanced training and equipment, confirming the quantitative findings. The establishment of a SMOT was considered crucial for overcoming the operational barriers provided by the CUCR's rugged terrain. Moreover, the qualitative data indicated the need for better coordination between military troops and civilian authorities, as well as the incorporation of advanced surveillance and communication systems.

The findings of this study clearly reveal that the establishment of a SMOT in the CUCR is driven mostly by terrain vulnerabilities, the demand for specialised training and the desire for modern equipment. While present security issues and existing forces' limitations are relevant, they are not the primary drivers for the establishment of an SMOT. The integration of advanced training, equipment and interagency cooperation will be key to the successful deployment of such a team, ensuring that the particular concerns of the CUCR are adequately addressed.

7. RECOMMENDATIONS

Based on the findings of the study, the following recommendations are made to ensure the successful establishment of a SMOT in the CUCR.

7.1 Initiate a SMOT Given Priority to SOF

Establishing a new specialised unit, regiment or team will be an extra burden for SLA with the existing situation of the country due to financial issues and the effort and time taken. Since, CDO and SF regiments are with some basic training and qualified personnel related to MO, with minimum effort and time, their skills can be developed. Therefore, it is recommended to initiate such a team within SOF.

7.2 Strategic Allocation of Resources

Equipping such a specialised team with advance equipment and new technology is very costly. Given the significant financial and logistical resources required to establish SMOT, the Army should adopt a phased approach. First, focus on equipping the existing CDO and SF with advanced equipment and training specific to MO, gradually expand the training to the infantry regiments, prioritizing those assigned to CUCR, leverage foreign partnerships for specialised training and access to modern equipment.

7.3 Conduct Regular Joint Field Exercises

Most of the participants agreed that terrain poses a challenge for security operations in CUCR. Therefore, conducting regular joint field exercises is essential to getting themselves orientated to the terrain and situations, specially collaborating with the Army, Air Force and civil authorities.

7.4 Prioritize Terrain Specific Training and Equipment

The findings clearly indicate that terrain vulnerabilities are the key element in evaluating the requirement for SMOT. Therefore, it is essential for the SLA to focus on tailored to particular terrains. This should include advanced navigation and map reading for mountainous terrains, survival and rappelling techniques for steep slopes and canopy jungles, as well as specialised CASEVAC and angled firing techniques for fight in mountainous terrain. Cold weather, climbing equipment, smart communication devices and surveillance technology are needed for productive operations in the CUCR.

7.5 Establish a Specialised Training Institute

Given the critical gaps in current training curriculums, the establishment of a specialised training institute with the assistance of foreign military who bear the MW experience is essential. 48.3% of respondents agreed and 39.7% of respondents strongly agreed on the necessity of such an institution, it would play a vital role in providing continuous skill development for infantry and SOF personnel, developing new instructors and experts to address the growing need for specialised knowledge and facilitating collaboration between the military and civilian agencies for coordinated security operations.

7.6 Enhanced Coordination with Civil Authorities

The analysis highlighted coordination issues with civil authorities, which prevents efficient security operations in CUCR. Therefore, it is advised that the SLA enhance its coordination efforts by creating cooperative communication networks with local authorities, undertaking periodic training exercises that combine both military and civilian personnel to improve trust and operational effectiveness.

7.7 Conduct Realistic Force Capability Assessments

While current security concerns were not considered a significant predictor for SMOT, it is critical that the Army not overlook the capacity shortfalls indicated in this research. Despite high morale and past preparation, a realistic assessment of force capability for MO is important. This should comprise a review of existing training programs to identify gaps and opportunities for improvement, as well as enhanced refresher sessions for soldiers who have previously received special operations training to adapt to the CUCR's specific terrain.

7.8 Close Cooperation with Air Force

Limited accessibility is a challenge for ground forces in CUCR. Therefore, enhancing security in the CUCR requires close collaboration between the SLA and Air Force. By extending cooperative operations, aerial surveillance, troop movement and logistical aid, both forces can address the specific challenges posed by the region's geography and mounting security concerns. Coordinated efforts will contribute to quicker response times, better situational awareness and an overall improvement in the operational effectiveness of the Sri Lankan Armed Forces in the CUCR.

8. CONCLUSION

Within the framework, the research study used both primary and secondary data, as well as qualitative and quantitative analysis. The researcher collected qualitative and quantitative data through interviews with professionals in the field of defence and history and a questionnaire developed around the research objectives and distributed to 290 officers from the infantry, CDO and SF. Data gathered from SMEs was analysed methodically using the qualitative technique of thematic analysis. The quantitative data were processed using IBM SPSS statistics in order to uncover significant patterns, relationships and insights. The terrain and regional characteristics of the CUCR including its steep slopes, dense forests and diverse ethnic communities are critical factors necessitating a specialised approach to security. The study highlights the need for culturally sensitive operations and protection of critical infrastructure and tourist sites. The vulnerabilities posed by the terrain are a central factor justifying the need for a specialised force.

While the Commando and Special Forces units possess some basic knowledge of MOs, the study revealed significant capability gaps in specialised MW tactics, equipment and training. The existing forces' experience in COIN operations in plain terrains does not fully prepare them for the unique challenges of the CUCR's rugged terrain. Improved interagency coordination and intelligence gathering are also needed. The study emphasised the need for advanced training in MW techniques, including navigation, survival and specialised casualty evacuation procedures. Additionally, the need for modern equipment such as cold-weather gear, advanced communication tools and surveillance technology was consistently identified. These elements are critical to ensuring the operational effectiveness of an SMOT in the CUCR. Based on the analysis, the study confirms the critical role that a SMOT would play in addressing the CUCR's unique challenges. The region's challenging terrain, combined with the limitations of current forces and the demand for specialised training and equipment, render establishing a SMOT a strategic necessity. The CUCR represents a strategic location that requires intensified security measures due to its economic, environmental and geographic significance. A specialised team, equipped with the appropriate skills and resources, will greatly enhance national security and the operational readiness of the Sri Lankan Armed Forces to respond to both conventional and unconventional threats in this strategically important region.

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ROLE OF WHEELED RECONNAISSANCE REGIMENTS OF SRI LANKA ARMoured CORPS IN EMERGING NON-TRADITIONAL THREATS: CHALLENGES AND WAY FORWARD

Major GDR Nimesh psc

ABSTRACT

This study examines how the 1st Reconnaissance Regiment of the Sri Lanka Armoured Corps (1 SLAC) addresses emerging non-traditional threats in urban environments. After conducting ten qualitative interviews with military officials, the study identified the main operational struggles, which included weaknesses in the fleet, a lack of funds for routine fleet maintenance, a shortage of military personnel, and deficiencies in Intelligence, Surveillance, and Reconnaissance (ISR) systems. The study reveals that methods employed in conventional combat are generally effective but less so in urban environments or during crises. Findings show that the regiment has performed well in several roles, including disaster relief, patrolling, pandemic response, and managing unrest during the 2022 political uprising. Research provides suggestions for acquiring new vehicles, merging ISR systems, improving urban resistance training, hiring specialized personnel, and allocating more resources to maintenance. Using these findings, military doctrine is revised and national security policies are updated to address threats in urban environments.

Keywords: Urban reconnaissance, Non-traditional threats, Military adaptation, Operational effectiveness, Security challenges

1. INTRODUCTION

Due to global political and technological changes, today's security vulnerabilities encompass threats that extend beyond traditional military activities (Khan, 2024). The Sri Lankan Armed Forces, particularly the 1st Reconnaissance Regiment of the Sri Lanka Armoured Corps (1 SLAC), have played a crucial role in addressing current security issues due to the specificity of their role and tasks, both during times of peace and war. The regiment relies on tracked armoured carriers (the BTR 80, 80A, and WMZ 551A models), enabling it to do well in places with different and new challenges, especially in cities. As a result, 1 SLAC differs from the 5th Reconnaissance Regiment, which is equipped with tracked armoured carriers, underlining the importance of using mixed forces for different tasks (Siddiqi, 2021).

The regiment has also demonstrated a strong ability to adapt to various conditions beyond its primary role and task, such as disaster relief; Coordinating efforts for defending against floods and assisting people, internal security; Ensuring safety in the community after the Easter Sunday attacks, health crisis response; Helping with COVID-19 containment through medical assistance and support for logistics, and civil unrest management; Properly handling our country's affairs and maintaining public order at '*Aragalaya*'. (Heaslip and Barber, 2014).

The study addresses the major operational issues the regiment encounters in urban areas, where threats differ from those in usual settings. Important matters to address are problems of wheeled armoured vehicles operating entirely in urban settings, the shortage of money, spare parts, and equipment is a common constraint on resources, Problems with updating technology and maintaining it, a lack of advanced technology, and not enough intelligence, and experiences related to challenges in coordinating interagency cooperation. The study aims to determine how the regiment can become more effective in responding to urban risks. These objectives encompass identifying operational challenges, assessing the success of ongoing strategies, and providing valuable advice for enhancing capabilities. The research examines the regiment's role in disaster relief, internal security, and handling asymmetric threats, as well as the options available to support urban safety. Apart from military technology, this research provides essential knowledge for disaster teams, civil security, and public safety. It plays a part in military studies by analysing the role of reconnaissance regiments as security issues change. The findings are intended to inform policy creation, planning, and the development of military doctrine, ultimately enhancing the country's security. To overcome today's challenges and prepare for future risks, the research aims to inform decision-making and improve overall security readiness as threats continue to evolve.

2. METHODOLOGY

A qualitative approach and an interpretivism philosophy were employed in this study to explore how reconnaissance is utilized in addressing new challenges. Since the interpretive approach could reveal different views from military leaders on reconnaissance missions, it was chosen to comprehensively analyse the complex relationships within military settings. The research relied on strategic recruitment to identify ten military officials who are influential in various types of military operations. The study involved key officers from Sri Lanka's armoured units, who had extensive experience performing reconnaissance actions, colonel commandant of the Sri Lanka armoured corps (SLAC), current and former commanders of the armoured brigade of SLAC, present and former commanding officers of 1st reconnaissance regiment (1 SLAC), two senior officers are involved in formulating armour GSP 2020,

squadron commanding officers from A and B squadrons, and technical adjutant of armoured brigade.

Experts' experiences in their operations, how they currently perform them, the obstacles they encountered, and what they anticipate in the future were all explored using semi-structured questionnaires. All of the interviews were taped and later changed into a written format so that they could be studied further. Analysis of the themes was conducted by coding the transcripts and identifying common ideas and patterns. All data were sorted into summary points relating to operational challenges, leadership, gathering resources, and providing guidance. Multiple strategies ensured research reliability are comparing information from different leaders in the organisation, returning the transcripts to respondents to check that they agree with the findings, and the coding and thematic categories were reviewed by individuals not affiliated with the study.

2.1 Conceptual Framework

The conceptual framework for the research is as follows.

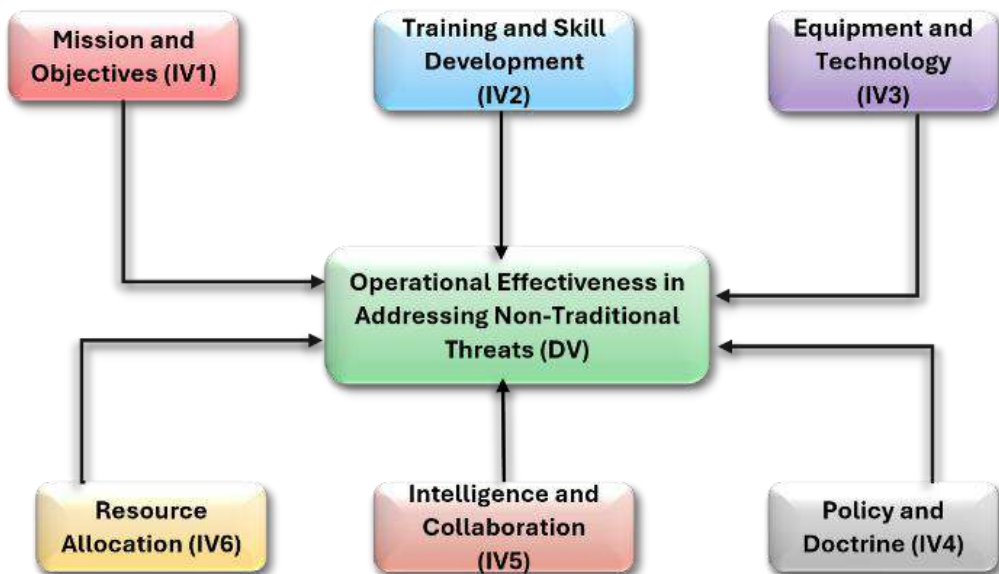


Figure 2.1: Conceptual Framework
Source: Author (2024).

3. LITERATURE REVIEW

3.1 Role and Global Context

Reconnaissance regiments are the primary sources for military commanders to gather information about what is happening in the field (Hodges, 1994). They mainly collect, study, and provide information on what the adversary is doing and the conditions of the ground beneath them. The range of these units makes them suitable for various battle situations. The successful use of anti-counterfeit technology is demonstrated in various production environments worldwide (Peng *et al.*, 2017). During Operation Iraqi Freedom, members of the United States Army 1st Cavalry Division's Reconnaissance Squadron conducted numerous scouting operations to help locate insurgent groups, providing commanders with immediate intelligence (Barry, 2016).

3.2 Operational Roles and Adaptability

Currently, reconnaissance regiments participate in regular wars and conflicts triggered by insurgency. Typically, they conduct reconnaissance activities, monitor critical facilities, participate in regular military exercises, and support their country in both peacetime and wartime operations. In counterinsurgency situations, they perform area security, monitor the field, quickly address threats, and assist the civil government in controlling the population (Sexton, 2016). Observing this example, the Sri Lanka Armoured Corps' 1st Reconnaissance Regiment is responsible for public order duties, Military Aid to Civil Power (MACP), disaster response, and collaboration with civilians. The military must respond to various threats by adapting to new changes in security risks (Marinov, 2025).

3.3 Effectiveness in Non-Traditional Threats

The analysis illustrated that reconnaissance regiments have been highly successful in addressing new types of threats worldwide (Stefanovich, 2020). VIP protection, convoy security, and peacekeeping efforts across the Middle East and Africa have greatly depended on their Armoured Personnel Carriers (APCs). In these operations, armoured personnel carriers on wheels are used for safety patrols, road exploration, and defence against asymmetric opponents. Improvements in ISR systems have allowed for a faster link between information collection and extended awareness in cities (Boyer *et al.*, 2015).

3.4 Urban Environment Challenges

The use of reconnaissance regiments has been greatly appreciated due to their capability to provide intelligence and assist complicated missions, but they have been

experiencing a lot of challenges when working in the city. Crowded urban areas, tall edifices, small streets, and cramped areas considerably decrease visibility and diminish the field of view necessary to perform successful surveillance and reconnaissance (Denman, 2020). The tactical complexity of urban fights is also added to the problem as the fighting can be on the surface, underground, and in the air at the same time, and some other challenges are presented by the fact that there is a risk of interference in the electromagnetic spectrum (Weissmann, 2023).

The need to create civilian presence in and around conflict areas also leads to the increased complexities as the line is difficult to draw between threats and non-combatants, and it will require a high level of care to minimize losses and guarantee the safety of life and property (Khorram-Manesh *et al.*, 2021). Besides, the issue of technological vulnerability concerns the congested electromagnetic spectrum, with communication potentially interrupted and enemies using cyber vulnerability and technologies being reliant. Logistical factors also impede efficiency because congestion in the city and limited routes restrict the passage of troops, supply delivery, and casualty evacuation (Munyaka and Yadavalli, 2021).

The strategic solutions to these challenges focus on incorporating the latest technological solutions like drones, sensors, and networked reconnaissance platforms that can improve situational awareness and operational accuracy (Hildmann and Kovacs, 2019). Systems such as Hermes 450 by Elbit Systems have been utilized in countries such as Israel and Singapore to enhance monitoring of the urban areas and the identification of targets. Also, training evolution is extremely important; it is essential to include the employment of advanced simulation devices like the Combined Arms Tactical Trainer (CATT) employed by the UK army that will contribute to higher adaptability and decision-making in complex urban environments (Radar, 2015). Enhancing interagency response- as in the disaster risk reduction model in Australia- strengthens further interagency responses to non-traditional hazards. Lastly, partnering, cost-effective and international collaboration enables efficiency and sustainability in sustaining high levels of performance in operational activities during urban reconnaissance missions (Radar, 2015).

4. FINDING AND DISCUSSION

This paper has discussed the reality of operations, the effectiveness of their strategies and the development of their capabilities that the 1 st Reconnaissance Regiment of the Sri Lanka Armoured Corps (1 SLAC) needed to counter the new non-traditional threats. The results, based on the interview with the key military officials, reveal four important operational issues, two significant strategic issues, and a number of internal

and external forces that affect the overall performance. The following discussion combines these findings with theoretical and empirical knowledge to give an overall picture of the current status of the regiment and priorities of its development in the future.

4.1 Operational Issues and Strategic Performance

4.1.1 Fleet and Maintenance Problems

One of its operational limitations which was found to be a huge setback was the degrading state of the BTR fleet in the regiment. Most cars are reaching final years of service and it has been even more difficult to acquire spares. The old fleet has lowered combat readiness and curtailed the capability of the regiment to be useful to both combat and disaster response missions. Experts pointed out that old-fashioned or inappropriately maintained vehicles undermine mobility and safety; particularly amid flood response, urban emergencies, or civil conflict when reliability and response speed are vital factors.

To forego this, there is also the fact there is not enough money to maintain the vehicles. In cases where there is limited budget on maintenance, there is increased downtime in the operations and the vehicles do not deliver the best performance. As a result, the regiment is less likely to offer timely support in case of emergencies as this undermines its preparedness and ability to execute various functions. This is consistent who found that the preparedness of reconnaissance units directly depends on the maintenance discipline and sufficiency of funds (Feickert, 2017).

4.1.2.2 Staffing Problems and Skills Lack

Another recurring theme was the absence of trained staff, especially in essential trades such as drivers, gunners, and tank commanders. These deficits have directly impacted the effectiveness of the regiment in conducting missions and being able to respond to emergencies effectively. Fewer personnel also means more stress for the remaining personnel, as they will respond more slowly and be less versatile in their operations. Strategically, such shortages are a manifestation of a mismatch between the contemporary training practice and the demands of modern warfare in cities. Reconnaissance operations in cities demand human resources of specific tactical, mechanical, and technological capabilities. Therefore, urgent focus on recruiting, retaining and trade-specific training should be taken so that the operational integrity of the regiment is preserved (Walton and Clark, 2021).

4.1.3 Technological Breaks and ISR Limitations

Lack of contemporary Intelligence, Surveillance, and Reconnaissance (ISR) systems and drone technology was reported as one of the key weaknesses that impacted situational awareness and decision-making. The police officials observed that the deficiency of real-time intelligence limits the flexibility of operations during rapidly developing crises like civil disturbances in a city or an epidemic. ISR integration has also enhanced the performance of reconnaissance around the world, as it has allowed real-time identification of threats and support decision-making (Emad Alfaris *et al.*, 2024). In the case of 1 SLAC, the use of drones, networked sensors, and surveillance systems would greatly increase precision, decrease risks, and coordinate better both in combat as well as humanitarian operations.

4.1.4 Strategic Effectiveness and Contemporary Modernization Requirements

Although the current operational strategies are applicable in the traditional warfare systems, they can be applied in urban settings only partly. The current strategies used by the regiment are not effective to counter the asymmetric and urban threats like organized crimes, terrorism, and unrest in the civilian population. This partial efficiency shows a strategic loss of contact between doctrine and contemporary needs. Professionals also stated that there is an urgent necessity of modernization in planning equipment and training. Conventional strategies need to be revised to include civil-military collaboration, digital ISR and training on urban resilience. In the absence of modernization, the regiment will lag behind in terms of its ability to successfully perform in the context of rapidly evolving situations (Felix, 2025).

4.2 Operating Effectiveness Influencing Factors

4.2.1 Internal Factors

Operational efficiency was found to be crippled by internal constraints especially old equipment, ineffective logistic and insufficient distribution of resources. The lack of the necessary tools and spares do not allow the regiment to perform to its full capabilities both in conventional warfare and non-conventional measures such as disaster relief or providing security. To maintain high levels of readiness, it is crucial to have efficiencies in equipment management, preventive maintenance, and resource-sharing mechanisms (Felix, 2025).

4.2.2 External Factors

The success of missions depends greatly on such external conditions as the urban population density, social pressure, and political limitation. Working in high density

cities requires new degrees of accuracy, moderation and collaboration among agencies. Successful military, police and civil authorities coordination becomes inevitable in such settings. In case of crises or civil disruptions, flexibility and new guidelines are required to prioritize mission goals over the safety of the population (Volosiuk *et al.*, 2024).

4.3 Combined Recommendations and Strategic Trails

Based on the findings and discussions above, there are a number of recommendations that are integrated to improve the overall performance of the regiment:

4.3.1 Modernization of Fleet and Resource Allocation

The first priority is modernization of the current fleet with better armament, mobility and communication facilities. Although it might not be possible to implement a total replacement at once, a replacement program in phases will maintain some degree of continued operation. Additional budgetary allocation to maintenance will also provide long term reliability of the fleet and combat readiness (Ali *et al.*, 2022)

4.3.2 ISR Systems and Drone Technology

The real time situational awareness, decision-making, and coordination will be improved by deploying hi-tech ISR platforms such as unmanned aerial vehicles and digital surveillance systems. Both combat and disaster response drones can be used to deliver essential intelligence, which allows one to respond to the changing threats in urban areas quickly (Alagurajan *et al.*, 2025).

4.3.3 Training and Human Resource Development

Creating a complex of training programs to underline the Concept of Operation (CONOPS) to counter urban warfare is a necessity. Such programs must consist of urban battle actions, field testing, and work with the city officials. The hiring and training of people to work in specialized trades like the ISR operators, mechanics, and CQB (Close Quarters Battle) specialists will make the regiment flexible to the changing requirements of operations (Alagurajan *et al.*, 2025).

4.3.4 Flexibility and Innovation of the Organization

A more adaptable organizational way must be adopted in order to utilize the resources available in a creative and efficient supply chain management. The use of feedback systems, field innovation, and continuous operational assessment will be used to ensure the built-in resilience in changing urban situations (Ghorban and Gholipour, 2018).

5. RECOMMENDATIONS

5.1 Strategic and Training Improvements

In order to make reconnaissance more efficient in the urban setting, it is necessary to make significant additions. The mission statements should also contain clear-cut instruction on the urban warfare strategies giving a clear guideline on how to operate in cities. The training programs ought to focus on the situations of urban fighting and the ways of interaction with civilians concerning the combination of the traditional systems and modern ones to develop hybrid capabilities. Swarming strategies along with human-machine teaming must be incorporated in organizational structures in order to make the most out of personnel-technology synergy. The use of drones needs to be carefully implemented in routine operations, and unmanned systems should become the element of the operations, instead of being used as additional mechanisms that increase situational awareness and tactical efficiency.

5.2 Equipment and Fleet Management

The modernization of the fleets must be more focused on modernizing the current vehicles rather than replacing them entirely and concentrate on better armor protection as well as the communication systems in the various platform. General-purpose vehicles are to be modified to specialized purposes such as electronic warfare, command and control operations and logistics support to ensure optimal operational flexibility and efficiency. Phased replacement plan allows a slow but continued updating of the fleet. The main focus should be on the acquisition of the highest level of improvements like the modular APC, urban-centric stealth drone, and improved surveillance systems, which will improve the reconnaissance processes in complicated urban settings.

5.3 Implementation Strategy

Implementation exercise must abide by a systematic eight-step process to bring systematized implementation of suggested improvements. Priority has to be given on obtaining equipments that offer maximum operational benefit in urban fighting situations to ensure resource assignment offers maximum battlefield performance. During the period of transition, continuity in the operations should be achieved to enable the regiment to remain in readiness and be able to perform its mission. These detailed recommendations focus on the achievement of particular improvements so that the abilities of the regiment to conduct urban warfare would be significantly improved without disrupting the current level of operational excellence and organizational functionality in the process of modernization.

6. CONCLUSION

This detailed inspection into the 1st Reconnaissance Regiment of the Sri Lanka Armoured Corps shows a very serious point of departure in military adjustment to present-day security threats. The study has established inherent operation gaps that play a crucial role in affecting the effectiveness of the regiment in an urban setting and non-conventional threat situations. Organizational interview of ten experts yielded four major issues, including the degrading fleet status (lack of spare parts), lack of maintenance funds, critical shortage of personnel in main areas of specialization, and technological inadequacy within ISR systems. The combination of these interrelated challenges has caused a domino effect, two decades of diminished readiness to operate at full capacity at a time when the regiment, with its various missions, such as responding to disasters during floods, addressing civil unrest during the 2022 Aragalaya, and others, should be capable of performing at its best. The research paper illustrates that, although the conventional reconnaissance tactics are still useful, they are not sufficient to the multidimensional and intricate nature of urban warfare as well as asymmetric threats that define the modern security context.

The way ahead lies in an overall change which involves a revised strategy doctrine, modernization of technology and improved training of processes specifically to operational requirements in the city. The recommendations on research give a systematic plan on how these shortcomings can be overcome by undertaking specific equipment upgrades, the incorporation of modern ISR, such as drone systems, training programs on comprehensive urban warfare, targeted personnel recruitment in key trade areas, as well as long-term investment in the maintenance infrastructure. These recommendations will not only ensure that the regiment is once again able to perform its duties but also make it a more adaptable and resilient force in terms of its capabilities to meet the current and arising security challenges. The results play a great role in shaping military doctrine and the national security policy, which can be of insight to other reconnaissance forces around the world. This underlines the fact that, to be successful in modern military operations, it is important that the equipment, training as well as strategic thinking constantly evolve in line with the dynamic nature of the contemporary threats.

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ADDRESSING THE DECLINE IN EDUCATED YOUTH ENLISTMENT: TOWARDS A COMPREHENSIVE NATIONAL SECURITY LANDSCAPE IN SRI LANKA

Major HMRS Herath psc SLE

ABSTRACT

This study explores the declining enthusiasm among educated Sri Lankan youth to join the Sri Lanka Army and evaluates its implications for a resilient national security framework. By analysing the empirical data obtained from student surveys and expert interviews, the study identifies critical socio-cultural, educational and economic deterrents that influence career selection. Findings highlight the split between military offerings and youth expectations, compounded by a shifting societal narrative that affects institutional trust. The study proposes comprehensive reforms in recruitment policy, military education alignment, public engagement and incentive systems to build a future-ready defence workforce, thereby contributing to a comprehensive national security landscape in Sri Lanka.

Keywords: Sri Lanka Army, Youth Recruitment, National Security, Military Sociology, Socioeconomic Determinants, Defence Policy

1. INTRODUCTION

The Sri Lanka Army has faced significant difficulties in attracting educated youth to enlist in active service roles in recent years which presents long-term implications for national defence and the broader strategic architecture. The Sri Lanka Army, once a key symbol of national pride and career aspiration during the war and immediate post-war reconstruction period, is now struggling to engage a new generation that increasingly aligns with globalised aspirations, private sector careers and international opportunities. This declining interest calls for a deeper investigation into the factors driving this shift.

The Sri Lanka Army plays a vital role in safeguarding the nation's security. During the three-decade-long conflict against the Liberation Tigers of Tamil Eelam (LTTE), the Army heavily relied on manpower to ensure national security and carry out humanitarian operations. Many recruits, including educated youth, joined the ranks to

support the fight against terrorism. However, since the cessation of the conflict, Sri Lanka has undergone significant socio-economic changes. These changes, along with evolving trends among young people, have profoundly impacted the military recruitment process.

This study primarily aims to explore the factors contributing to the declining interest among educated youth in joining the Sri Lanka Army. It examines various dimensions, including economic, educational, social, cultural and historical contexts, to provide a comprehensive understanding of the issue. With the current educational background, every child stepping into youth has various educational opportunities in the private sector. Their perceptions of career progression are the main factors determining career paths. With advanced access to higher education and opportunities to obtain higher degrees, many educated youths prioritise academic and professional growth over military service. Moreover, with the current trend of the economic situation, most of the youths in Sri Lanka are involved in modern self-employment systems utilising advanced technologies. Thus, this study assesses the current economic impact to explore the economic variables influencing the decision to pursue a military career. Additionally, social and cultural influences, including family preferences, societal perceptions and cultural attitudes, are significant factors. During the post-conflict period, public perception and interest in the Sri Lanka Army have deteriorated due to various reasons. In this regard, family members and societal norms can either encourage or discourage youth from joining the Sri Lanka Army.

This study ultimately aims to find out various factors contributing to the waning enthusiasm among educated youth for joining the Sri Lanka Army and to provide necessary recommendations for implementation. These recommendations are designed to attract educated youth to the Sri Lanka Army, thereby enhancing the professionalism and operational readiness of the Sri Lanka Army as a key organisation safeguarding national security.

1.1 Background of the Study

The demographic dividend in Sri Lanka provides a vital opportunity to reinforce national institutions such as the Armed Forces. But the present day educated youth is largely disengaged from military service. This is exacerbated by a post-conflict societal shift where the military is no longer at the centre of national attention. The increased access to tertiary education and expanded professional fields has led youth to reconsider traditional service roles. Furthermore, recent political unrest and economic crises have influenced public trust in national institutions.

The Sri Lanka Army gained a strong reputation during the long fight against the LTTE and has been essential for national defence. After successfully defeating the LTTE, the Army's role changed, becoming involved in rehabilitation and development projects, such as humanitarian demining and initiatives like "Uthuru Wasanthaya" and "Nagenahira Udanaya". Many educated professionals joined the Army during this time. However, as the situation and economy changed, there has been a noticeable decline in the enthusiasm of educated youth to enlist in the Sri Lanka Army, posing significant challenges for national security and military readiness.

One major reason for this loss of interest is the economic condition of Sri Lanka and its impact on society. Advanced economic techniques in the service sector and the fast-growing private sector economy have led to increased employment opportunities for youth. These sectors often provide more attractive compensation packages and career advancement. Economic stability is a significant factor in career decision-making and the perception of financial security and long-term economic benefits are often stronger in the private sector than in military service.

Recent trends also show a growth in higher education opportunities in Sri Lanka. Most youth actively pursue higher education in private and government universities, while those who do not enter university follow various technical courses in technical colleges to uplift their skills. In contrast, the military context offers limited space for enlisted recruits or Officer Cadets to develop their professional skills in their respective fields. Consequently, the Sri Lanka Army's career structure and progression may not align with the expectations of today's educated youth which results in declining interest in military careers.

Beyond economic and educational contexts, social and cultural backgrounds play a vital role in career choices. Family expectations, societal norms and cultural attitudes significantly affect the decision-making process of young educated individuals. In present day context, most families prioritise economic stability over societal perception. While the military profession is considered a prestigious opportunity, the economic stability for military personnel is often a slower process compared to other professionals of the same age.

This study aims to identify the factors influencing youth enlistment in the Sri Lanka Army, examine the reasons behind the declining interest among educated young individuals, and develop comprehensive guidelines to attract and retain a more educated youth demographic in the Army.

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Existing literature points to several determinants of enlistment behaviour, institutional trust, career path transparency and socio-economic context. Social identity theory and rational choice models explain career behaviour among youth, suggesting that personal aspiration, social validation and opportunity cost govern decisions. Research from countries like the United States, the UK and India confirms that educational incentives, economic mobility and post-retirement transitions significantly affect recruitment. This paper builds on these foundations while contextualising findings in the Sri Lankan socio-political fabric.

The Sri Lanka Army, as the largest organisation in the country, is primarily responsible for safeguarding national security. During the 30-year conflict, a significant expansion of the strength of the Army was essential, with youth aged 18-24, regardless of educational background, joining the ranks. Post-2009, the Army focused on enhancing the recruitment standards, leading to an increase in educated youth enlistment between 2010 and 2014. However, after 2015, a decline in enlistment of educated youth to the Sri Lanka Army was observed due to various factors. This study aims to explore these factors, including economic, educational, social, cultural and historical contexts, to provide a comprehensive understanding of the issue.

2.1 Social and Cultural Factors

Social and cultural factors significantly influence the youth enlistment. The strong media campaigns in Sri Lanka during the humanitarian operation period contributed to a surge in enlistment. Jennings and Markus (2017) emphasised that a society's social and cultural context is a key determinant in youth participation in military service. Military reputation and public perception also play a vital role. Eighmey (2006) highlighted that views of the society on the military significantly influence individuals' willingness to join. During Sri Lanka's Humanitarian War, the government's media campaign positively influenced public perception and recruitment. After the war, the Army's involvement in nation-building tasks further increased enlistment. However, the study identifies a decrease in social recognition of the military in some countries, necessitating maintaining a high standard of military atmosphere to attract youth.

2.2 Educational Factors

Blades and Smith (2017) highlighted that many young, educated recruits face challenges in pursuing their professional expertise within the military, as combat scenarios often limit such opportunities. This misalignment deters educated youth from joining. Interviews revealed that youth qualified in specific fields desire opportunities

to practice their professions within the military, but gaps persist in formal recognition and advancement. Most young individuals undergoing higher education seek to achieve personal and professional goals through stable employment, career progression and opportunities instead of joining the military. Task & Purpose (2024) argued that military training can lead to missed opportunities for higher education. It was further revealed a Cronbach's Alpha reliability level of 0.856, emphasising the strong influence of education on the enlistment process.

2.3 Economic Factors

Economic conditions profoundly influence career choices, particularly among educated youth. During economic downturns, the military can offer more employment opportunities than private employers may provide. Stable employment with benefits is a global occurrence. Spence, Henderson and Elder (2012) noted that during recessions, military benefits like secure employment, healthcare and housing become highly attractive. But Warner and Asch (2001) argued that in a booming economy with excellent civilian opportunities, military enlistment becomes extremely difficult. Educated youth particularly seek well-paying civilian jobs commensurate with their qualifications and career expectations. Recent economic fluctuations in Sri Lanka have influenced negative perceptions of youth toward military careers.

The financial incentives and benefits play a huge role when it comes to recruitment strategies. Educational benefits and scholarships particularly appeal to educated youth, covering tuition fees, stipends and further education opportunities. Simon and Warner (2007) suggested that attractive financial packages make the military recruitment more effective and appealing. Williams (2003) elaborated that decent financial offers make military service more attractive for educated youth, who face an opportunity cost when choosing military service over civilian careers. The Sri Lanka Army should ensure its financial incentives are competitive and well-advertised to attract potential recruits. Winslow (1998) highlighted that the cost of living and adequacy of military compensation matter to educated youth. Ensuring competitive pay and benefits, including housing allowances, healthcare and retirement plans are critical for maintaining interest in military careers. Jennings and Markus (2017) emphasised that competitive pay and benefits are crucial for recruitment, especially among educated youth with higher earnings expectations.

3. METHODOLOGY

This study adopted a mixed-methods research approach. A well-structured questionnaire was distributed among a sample of 150 university undergraduates from multiple faculties within the Colombo district. All the respondents were selected using

stratified random sampling to ensure representation from science, management, arts and technical disciplines. Additionally, in-depth interviews were conducted with Officers responsible for enlistment and cadet recruitment from the Directorate of Personnel Administration of the Sri Lanka Army, including.

The study followed a stage-by-stage process to ensure a rational methodological flow within a specific period. Every stage was organised to align with the research objective and address the research problem.

Stage I: Primary data was collected from relevant literature to finalise independent and dependent variables based on past studies in the same field. Research boundaries were set according to the timeframe and other limitations. Based on this information, the study area, population and data collection methods were determined, leading to the development of the conceptual framework.

Stage II: After the conceptual framework was determined, structured questionnaires were developed. Several variables of the sample group were considered, including socio-cultural factors, educational factors, economic factors and recruitment strategies. Open-ended questions were also formulated under these variables to collect primary data through interviews.

Stage III: The third phase involved disseminating the questionnaire via Google Forms online to collect primary quantitative data. Concurrently, in-person meetings were held with key figures familiar with qualitative data related to the factors contributing to the declining interest among educated youth in joining the Sri Lanka Army.

Stage IV: During the final stage, a detailed examination and analysis were conducted using SPSS and thematic analysis methods. After analysis, the data were presented, and relevant findings were used to formulate feasible recommendations.

The Regression analysis was used to analyse the quantitative data to identify relationships between variables such as parental influence, academic ambition, military perception, and income expectations. Qualitative data were thematically coded to provide context and depth to the statistical findings.

4. FINDINGS AND DISCUSSION

Survey data showed that only 18% of university respondents viewed military service as a viable career. Among the most frequently cited concerns were:

- a. Limited access to postgraduate or continuous education while in service.
- b. Social perception that military careers are regressive.
- c. Comparatively lower remuneration and fringe benefits.
- d. Concerns about long-term health risks and family impact

Expert interviews also supported these findings where one officer stated that even though they recruit high-calibre cadets, many opt out early due to lack of academic opportunities and proper promotion timelines. Regression analysis revealed statistically significant correlations between educational aspiration and rejection of military pathways ($p < 0.05$).

The analysis of demographic data revealed insights into the age, gender and family background of the responders, as well as their interest in joining the military, sources of information on military careers and primary motivations for choosing their current degree programmes. Reliability analysis for socio-cultural, educational, economic factors and recruitment strategies was conducted, showing robust internal consistency for each.

4.1 Socio-Cultural Factors

The findings from the socio-cultural factors indicated that family preferences and societal perceptions significantly influence the decision-making process of educated youth regarding a military career. Particularly after the humanitarian operations, changing societal perceptions of the military have reduced the prestige and appeal of joining the armed forces. Cultural norms and family influences also play a significant role in shaping career choices, often steering young people away from military careers.

4.2 Educational Factors

The study found that the educational backgrounds and academic aspirations are crucial in influencing youth interest in military service. The findings highlighted that educated youth prioritise academic and professional growth and perceive limited opportunities for such advancement within the military. The lack of alignment between professional skills and military roles deters educated youth from joining the military.

4.3 Economic Factors

Analysis of economic factors revealed their substantial impact on the enthusiasm of educated youth for joining the Sri Lanka Army. The availability of higher-paying civilian jobs and perceptions of greater financial stability in non-military careers were significant deterrents. The study indicated that the current economic situation, with its emphasis on self-employment and advanced technologies, draws youth away from traditional military careers.

4.4 Recruitment Strategies

The study found that traditional recruitment procedures are not sufficient enough for reaching out to and motivating educated youth. Despite 58% of respondents using the internet and social media as their main source of career information, the military's recruitment advertisement has not fully utilized the digital platforms. This highlights the need for more appropriate, focused approaches that respond to the digital orientation of young people. The multiple regression analysis revealed statistically significant correlations between these factors and the declining interest in military pathways. Qualitative data analysis further provided rich context and depth to these statistical findings, elucidating the nuanced perceptions and motivations of educated youth and expert insights.

4.5 Discussion

The results indicate a profound shift in youth values. Where previous generations might have prioritised patriotism and job security, today's youth weigh career adaptability, global relevance and academic progression more heavily. The current Army structure, while institutionally disciplined and stable, does not appear to offer compelling value propositions to the educated youth. Furthermore, outdated public relations strategies and inflexible career tracks amplify this divide. In rural areas, military service still garners interest, but this is declining as private vocational institutions grow and foreign employment remains lucrative. These trends suggest that unless reforms are initiated, the Army will struggle to replenish its ranks with educated, tech-savvy leaders capable of adapting to hybrid threats.

The discussions built upon the findings of each factor, providing justification and deeper insights. The findings from demographic data revealed consistent patterns with the broader trends observed in youth career choices. The declining interest in joining the military was directly linked to the changing aspirations of educated youth, who are

increasingly seeking professional development and higher education opportunities. The study's discussion on socio-cultural factors emphasised how family expectations and evolving societal norms influence career decisions, often leading youth away from military service.

The discussion on educational factors highlighted the perceived limitations within the military for pursuing professional expertise and advanced degrees, which contrasts sharply with the aspirations of educated youth. This disconnect was a significant deterrent. Economic factors were discussed in relation to the attractiveness of higher-paying civilian jobs and the perception of greater financial stability outside the military. The discussion underscored that while the military offers stable employment, its compensation packages and career progression might not be perceived as competitive enough compared to the rapidly growing private sector.

The discussion on recruitment strategies confirmed that traditional and conservative approaches are no longer effective in reaching the digitally-oriented youth. There is a clear need for modern, targeted campaigns that leverage social media and other digital platforms to communicate the benefits and opportunities of military service. Overall, the discussions converged on the idea that the Sri Lanka Army must adapt its offerings and communication strategies to align with the evolving values and expectations of educated youth to ensure a steady influx of capable personnel for future national security challenges.

4.6 Strategic Implications for National Security

The erosion of educated enlistment has broader ramifications. As warfare becomes increasingly technical, the demand for officers with skills in cyber, logistics, engineering and languages will rise. Without attracting these individuals, national preparedness and modernisation objectives will be compromised. In addition, international partnerships, peacekeeping missions and regional military diplomacy rely heavily on an educated officer cadre that can operate in multinational, multicultural environments.

The decline in interest among educated youth poses significant challenges for maintaining a skilled and capable force essential for national security and operational readiness. The Army's ability to face future dynamic security challenges, including hybrid threats, requires sufficient troops with advanced skills and adaptability. The current trend directly impacts national preparedness, as the military struggles to attract and retain educated individuals despite various recruitment campaigns.

Furthermore, the core argument of this study asserts that the declining interest is influenced by various social, economic and educational elements, as well as the availability of better job opportunities, which contribute to negative perceptions of military careers and limited awareness of their benefits. This misalignment with personal goals and economic uncertainties, coupled with the influence of family and peers, means many educated youth find the military environment does not meet their needs. To maintain operational readiness and attract educated youth, the Sri Lanka Army must adopt innovative recruitment strategies that effectively communicate the advantages of military service, align career opportunities with the aspirations of young people and address socio-economic and psychological barriers. By understanding and tackling these issues, the Sri Lanka Army can enhance its appeal and ensure a steady influx of educated young individuals into its ranks.

The significance of this study lies in its ability to analyse the factors contributing to the waning interest of educated youth in joining the Sri Lanka Army, thereby providing insights for decision-makers to develop strategies to attract and retain educated individuals. By examining sociocultural, economic, psychological and informational factors, the study uncovers the real reasons for the decline in interest, guiding strategic decision-makers in conducting pilot surveys and taking appropriate actions. The study also highlights economic factors affecting recruitment, identifying current and future demands for the Army's salary scale and facilities and promoting a better working environment to improve public perception of military personnel's economic stability. Linking military career prospects to the aspirations of modern educated youth can make military service more appealing, ultimately benefiting military strategic planning and readiness by attracting a diverse and dynamic workforce to address future security challenges.

5. RECOMMENDATIONS

To reverse current trends, the following recommendations are proposed:

5.1 Military-Academic Partnerships

Establish joint programmes with universities to offer service-based degrees with international recognition. This can include dual-degree programmes, credit transfers for military training and joint research initiatives that allow service members to pursue academic advancement without sacrificing their military careers. Such partnerships can bridge the gap between military service and educational aspirations, making the Army a more attractive option for academically inclined youth.

5.2 Transparent Career Progression

Develop flexible promotion schemes that reward both academic achievement and operational excellence. This involves clearly outlining career pathways, demonstrating opportunities for specialisation in high-demand fields like cyber security or engineering and ensuring that continuous learning is integrated into career development. Transparent progression plans that recognise civilian qualifications and offer clear routes to leadership roles can provide the certainty and growth potential that educated youth seek.

5.3 Public Image Revamp

Use digital storytelling, alumni testimonials, and modern branding to reshape the military's appeal. This should include targeted recruitment campaigns that effectively highlight the benefits and opportunities of a military career. Leveraging social media platforms like Facebook, Instagram and YouTube to share engaging content, success stories and informational videos about military careers is crucial. Emphasising national pride, community service and the unique opportunities within the military, tailored campaigns can enhance the appeal of military service. Engaging Sri Lankan influencers, young professionals or public figures can help present the Army as a forward-thinking and attractive career choice.

5.4 Financial and Housing Incentives

Provide performance-linked bonuses, subsidised housing and early retirement entrepreneurship grants. The Sri Lanka Army should more actively communicate the financial benefits of military service, such as free accommodations, medical care and pension provisions. These benefits should be prominently highlighted during recruitment campaigns and university outreach efforts. Ensuring competitive military remuneration in line with the cost of living is essential to attract and retain educated youth, promoting job security, promotion opportunities, and strong pension plans.

5.5 Recruitment Modernisation

Leverage AI-driven profiling to match candidate aspirations with military roles and invest in targeted campus outreach. The Sri Lanka Army should adopt a digital-first recruitment approach. This should include professional networks and targeted advertising. Developing web-based programmes and virtual tours that allow potential recruits to explore job opportunities based on their skills and interests would provide an engaging and professional way to inform educated youth about various career

possibilities within the military. Furthermore, communication of clear career progression pathways, showcasing how recruits can advance within the organisation and highlighting the potential for career growth, is vital as many young Sri Lankans may not be fully aware of the available opportunities.

6. CONCLUSION

The declining enthusiasm among educated youth to enlist in the Sri Lanka Army signals a growing disconnect between national defence objectives and youth aspirations. Bridging this gap requires intentional, data-driven reforms that go beyond salary and structure. It necessitates a cultural reorientation of the military as a modern, future-ready institution aligned with the ambitions of Sri Lanka's next generation, thereby contributing to a comprehensive national security landscape. Addressing these challenges requires a multifaceted approach that involves enhancing the perception of military careers, providing competitive incentives and implementing effective recruitment strategies. By understanding and addressing these factors, the Sri Lanka Army can improve its recruitment efforts and ensure a steady influx of motivated and capable personnel.

Further study is essential to deepen understanding and address emerging trends. Future studies could focus on longitudinal analyses to track shifts in youth attitudes over time, particularly in response to recent recruitment policies. Additionally, systematic research should evaluate the effectiveness of changes in recruitment strategies and incentive structures on enlistment rates among educated youth

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DEVELOPING A COMPREHENSIVE NATIONAL SECURITY LANDSCAPE FOR SRI LANKA: CONSIDERATIONS FOR SUSTAINABLE SECURITY FRAMEWORK

Lieutenant Commander KMGDK Dias psc

ABSTRACT

Considerations for the creation of a thorough national security framework for Sri Lanka in response to its changing threat environment are examined in this paper. With its location at the intersection of important sea lanes and its complicated post-conflict history, Sri Lanka is vulnerable to both conventional military threats and a growing number of non-traditional security threats. These include economic instability, environmental degradation, cyberattacks, transnational terrorism, and disasters brought on by climate change. The study makes the case that in order to protect sovereignty, maintain social stability, and promote sustainable development, a multifaceted security strategy that strikes a balance between hard and soft security measures is necessary. The study offers an integrated security architecture that prioritises interagency coordination, legal reform, civic engagement, and regional cooperation by analysing historical context, regional dynamics, institutional gaps, and international best practices. The importance of technology adaptation, human security, and public involvement in fostering resilience are highlighted in particular. According to the paper's conclusion, maintaining Sri Lanka's long-term national security in a world that is becoming more interconnected and unstable requires a proactive, inclusive, and flexible approach.

Keywords: National Security, Sri Lanka, Non-Traditional Threats, Strategic Resilience, Regional Cooperation

INTRODUCTION

1. The foundation of a country's stability, prosperity, and long-term growth is its national security. Security issues for Sri Lanka, a strategically placed island in the Indian Ocean, go beyond preserving territorial integrity to include handling a wide range of new and complicated issues. According to Gunaratne (2014), these comprise both traditional military threats and non-traditional risks like cyberattacks, terrorism, economic vulnerability, and natural disasters.

2. A unique security environment has resulted from the legacy of Sri Lanka's internal conflict, especially the lengthy civil war that ended in 2009. The country still faces changing security threats despite significant advancements in post-war reconstruction and socioeconomic recovery (Sumanthiran, 2018). These difficulties are made worse by changing regional and global geopolitical conditions. Major powers like China and India, both of whom have strategic interests that affect Sri Lanka's security outlook, have become more prevalent in South Asia, causing tensions to rise and alliances to shift (Brewster, 2013). Effectively handling these developments is essential for Sri Lanka's national security posture.

3. A wider, more inclusive approach to national security is being promoted by academics and policymakers as a result of the growing awareness of non-traditional threats like cyberwarfare, transnational terrorism, and climate change (Bajpai and Hagerty, 2016). The traditional security paradigm, which prioritises territorial integrity and military defence, is no longer sufficient to handle the complex threats of the contemporary world. This calls for the creation of a thorough national security plan for Sri Lanka that takes into account both "soft" (economic, environmental, and societal) and "hard" (military and defence related) security aspects (Katzenstein, 2005).

4. Furthermore, the necessity of an integrated approach is further supported by the growing interconnectedness of global security threats. Domestic stability is intertwined with international security trends, as demonstrated by the rise of cybercrime, global terrorism, and climate-induced disasters (Chandran, 2019). Multilateralism and regional cooperation are also increasingly crucial elements of national security. Natural disasters, cross-border terrorism, and maritime security are examples of issues that call for coordinated efforts and common frameworks across national borders (Kumar, 2018).

5. The purpose of this paper is to suggest considerations for a comprehensive national security framework for Sri Lanka that incorporates non-traditional risks into a comprehensive plan while simultaneously attending to traditional defence imperatives. Protecting Sri Lankan citizens, maintaining sovereignty, and advancing regional and international stability are the goals. In addition to incorporating international best practices in security governance, the suggested model will take into account Sri Lanka's distinct geopolitical location, sociopolitical realities, and historical background (Dissanayake, 2020).

6. Sri Lanka can create a sustainable and flexible security architecture by combining military readiness with diplomatic, economic, and environmental resilience in a multifaceted national security strategy. A model like this will improve the nation's ability to effectively address current and new threats.

UNDERSTANDING THE EVOLVING THREAT LANDSCAPE

7. The idea of national security is dynamic and complex, and it changes as local, regional, and international conditions do. Developing a successful national security strategy for Sri Lanka requires an awareness of the changing threat landscape. Over the past few decades, the nature of security threats has changed, calling for a more comprehensive, integrated strategy that goes beyond conventional military defence. This change reflects the nation's increasingly complex traditional and non-traditional security threats, which are impacted by environmental issues, economic vulnerabilities, technological advancements, and geopolitical dynamics.

8. **Traditional Security Threats.** The history of conflict in Sri Lanka, especially the civil war that lasted for almost thirty years and ended in 2009, is a major factor in the country's security environment. The nation's security concerns are still centred on possible territorial integrity issues, foreign military influences, and regional rivalries, even though the end of the war marked a significant reduction in conventional military threats. Major world powers, especially China and India, are interested in Sri Lanka because of its strategic location in the Indian Ocean, a vital maritime trade route. Due to the potential for strategic tensions caused by foreign military presence in the area, this geopolitical significance carries both opportunities and risks (Brewster, 2013).

9. There are risks associated with the resurgence of regional security issues. Particularly in South Asia, there have been military conflicts, mostly between India and Pakistan. Although nuclear deterrence has historically been used to frame these tensions, the regional landscape has grown more complicated as global powers like the US, China, and Russia vie for influence. These powers' influence has added new risks to Sri Lanka's security environment, especially in areas like airspace security and the maritime domain. Maintaining strong defence capabilities while striking a balance with international relations is crucial as the nation negotiates these complexities (Bajpai and Hagerty, 2016).

10. **Non-Traditional Security Threats.** A number of non-traditional security threats have emerged as a result of the shifting global environment, and they are now a bigger part of Sri Lanka's security strategy. Cybersecurity is among the most well-known. Cyber threats have become an increasingly significant risk to critical infrastructure and government institutions as the world grows more digitally connected. Like many other countries, Sri Lanka has recently been the target of serious cyberattacks. In order to disrupt economies, steal confidential data, and cause chaos, cybercriminals, state-sponsored hackers, and terrorist groups are increasingly taking advantage of digital vulnerabilities (Chandran, 2019). To safeguard Sri Lanka's digital

infrastructure, this transition to cyberwarfare calls for the creation of cybersecurity frameworks and the development of cutting-edge technological capabilities.

11. Another new non-traditional threat is transnational terrorism. Despite Sri Lanka's victory over the Tamil Tigers, there is still a risk of terrorism and radicalisation. The 2019 Easter Sunday bombings tragically demonstrated the role of international terrorist networks operating both inside and outside of Sri Lanka's borders, as well as the threat posed by religious extremism. It is getting harder for any country to fight this threat on its own since terrorist groups, especially those associated with ISIS, take advantage of international communication networks and cross-border travel (Sumanthiran, 2018). As a result, Sri Lanka's counterterrorism initiatives need to be multifaceted, including social and psychological measures to stop radicalisation in addition to military and intelligence tactics.

12. **Environmental and Climate-Induced Risks.** The effects of environmental hazards and climate change are frequently disregarded in the context of national security. The island nation of Sri Lanka, which is located in the Indian Ocean, is extremely susceptible to landslides, floods, and tropical cyclones. These risks are getting worse due to rising sea levels and erratic weather patterns, which are made worse by global climate change (Kumar, 2018). Environmental catastrophes can overwhelm the nation's emergency response systems, upend its economy, and force people to relocate. To guarantee readiness for environmental emergencies, Sri Lanka's national security strategy must incorporate climate security.

13. Furthermore, competition for natural resources, like water and fertile land, can intensify social unrest, especially in rural and conflict-prone areas of Sri Lanka. Long-term national resilience will require proactive climate adaptation measures in addition to strategic management of natural resources (Gunaratne, 2014).

14. **Economic Security and Vulnerabilities.** Another essential element of Sri Lanka's national security is economic stability. Dependency on foreign aid, changes in commodity prices, and external debt are examples of economic vulnerabilities that can compromise a nation's sovereignty and ability to defend itself. Additionally, a faltering economy raises the possibility of social unrest and internal instability. Therefore, diversifying trade partners, lowering reliance on debt, and bolstering economic governance are necessary to improve the nation's economic security (Dissanayake, 2020).

FOSTERING PUBLIC AWARENESS AND ENGAGEMENT

15. Without the public's active involvement and support, a comprehensive national security strategy is lacking. Promoting public awareness and community involvement is crucial for the efficacy and legitimacy of national security policies in democratic societies like Sri Lanka, where civic engagement and transparency serve as the foundation for governance. Building trust between citizens and state institutions is a key component of sustainable security, and public participation helps with resilience and early threat detection.

16. The first line of defence against many non-traditional security threats, such as terrorism, misinformation, and cybercrime, is public awareness. For example, community watchfulness was essential in spotting suspicious activity before the Easter Sunday bombings in 2019. According to Sumanthiran (2018), two major shortcomings in national readiness were the absence of prompt public reporting and the breakdown of communication between communities and law enforcement. This tragedy made it clear how crucial it is to create a security culture that informs, educates, and inspires people to take part in preserving national security.

17. Comprehensive civic education is the first step towards effective public engagement. It is possible to demystify national security issues and promote responsible citizenship by incorporating security literacy into media programming, public campaigns, and educational curricula (Dissanayake, 2020). Knowledgeable people are more likely to oppose radical ideologies, work with authorities, and prevent the spread of false information. Both digital and traditional media are essential to this process. When combined with open government communication, responsible journalism can influence public opinion and promote a fair comprehension of security issues (Kumar, 2018).

18. Furthermore, by decentralising the national security effort, community-based security initiatives—like neighbourhood watch programs, local disaster response units, and community policing—can significantly increase state capacity. In addition to empowering local communities, these grassroots initiatives foster mutual respect and collaboration between the public and security forces (Gunaratne, 2014). Community-led early warning systems and preparedness training, for instance, have greatly lessened the impact of floods and landslides in areas vulnerable to natural disasters, underscoring the importance of public participation in environmental security.

19. Leaders in civil society and religion also play an essential role. The religious and ethnic diversity of Sri Lanka shapes its sociocultural landscape, and local leaders frequently enjoy greater trust from the populace than do state actors. By involving these

leaders in national security discussions, we can counter extremism, advance peacebuilding, and develop inclusive narratives that reject polarisation and violence (Chandran, 2019).

20. However, the state must also respect the values of accountability, transparency, and human rights in order to promote public participation. Public resistance, alienation, and mistrust can result from overbearing or opaque security measures. Accordingly, effective public engagement requires a human-centric approach to national security, one that upholds civil liberties while guaranteeing public safety (Bajpai and Hagerty, 2016).

DEVELOPING A COMPREHENSIVE NATIONAL SECURITY FRAMEWORK

21. In order to create a comprehensive national security framework for Sri Lanka, a proactive, multifaceted, and inclusive strategy must replace a reactive, militarised one. A well-coordinated, forward-looking framework that fortifies state institutions, involves civil society, and promotes resilience at all levels is necessary given the nation's changing threat environment, which includes traditional, non-traditional, and hybrid security challenges.

22. **Integrating hard and soft security measures.** Traditionally, Sri Lanka's national security has been dominated by military and police responses, especially during and after the civil war. The preservation of a credible defence capability is still crucial, particularly when it comes to border security, maritime security, and counterterrorism, but soft security domains like cybersecurity, economic stability, environmental preservation, and public health now require more attention (Bajpai and Hagerty, 2016). In recent years, these domains, which are frequently disregarded in conventional security models, have demonstrated their strategic importance, especially during the COVID-19 pandemic and the increase in climate-related disasters (Kumar, 2018).

23. **Interagency, whole-of-government strategy.** Government agency fragmentation in Sri Lanka has resulted in deficiencies in response mechanisms, coordination, and intelligence sharing (Gunaratne, 2014). In order to integrate the efforts of defence, intelligence, disaster management, health, ICT, and economic institutions, a national security council or central coordinating authority is essential. In addition to spearheading strategy formulation and threat analysis, this body should guarantee quick reaction times and ongoing policy modification.

24. **Reform of laws and policies.** Clear, modern, and democratic legal tools are necessary to support national security. To remain in line with global norms and

Changing threats, laws pertaining to cybersecurity, counterterrorism, data protection, and disaster management must be reviewed on a regular basis. To preserve public confidence and avoid the securitisation of public space, such laws must simultaneously uphold fundamental human rights and civil liberties (Dissanayake, 2020).

25. **International and regional cooperation.** In order to promote collective security, Sri Lanka, an island nation situated at a significant maritime crossroads, needs to actively participate in regional organisations such as SAARC, BIMSTEC, and the Indian Ocean Rim Association (IORA). Intelligence sharing, maritime security operations, and capacity building can be improved through strategic alliances with regional nations like India and multilateral organisations like the UN and ASEAN (Chandran, 2019).

26. **Human security and resilience.** This entails giving social cohesiveness, access to justice, food and water security, and disaster preparedness top priority. Long-term peace can be established and extremism and social unrest can be avoided by making sure that women, youth, and minority groups are included in national security discourse (Sumanthiran, 2018).

27. **Integrating technology-based solutions, risk forecasting and scenario planning.** Technology provides strong tools for early warning systems, surveillance, and threat detection. Real-time monitoring of border activity, maritime routes, cyber networks, and environmental conditions is made possible by developments in artificial intelligence (AI), big data analytics, geographic information systems (GIS), and satellite imaging (Brewster, 2013). Decision-makers can more effectively allocate resources and foresee threats thanks to these capabilities. When incorporated into national planning, risk forecasting makes it possible to identify new vulnerabilities before they become apparent. Contingency planning and resource prioritisation can be influenced by predictive models that are based on economic, environmental, and geopolitical indicators (Kumar, 2018). Forecasting tools, for example, can identify areas that are vulnerable to economic distress or displacement brought on by climate change, enabling proactive policy interventions.

KEY CONSIDERATIONS

28. A number of important factors that take into account Sri Lanka's past, present, and future goals must direct the creation and application of a thorough national security framework. Military readiness, civil liberties, institutional coherence, public participation, and international cooperation must all be carefully balanced for a security strategy to be both successful and long-lasting.

29. **Historical context and conflict sensitivity.** Perceptions of state authority are still influenced by Sri Lanka's protracted civil war and its aftermath, especially among ethnic minorities. Future security strategies must take this legacy into consideration and make sure that excessive state control or marginalisation is not justified by national security. According to Sumanthiran (2018), inclusive security policies should instead encourage social cohesion, reconciliation, and equitable development. In addition to being morally required, protecting cultural diversity and minority rights is strategically necessary to avoid internal instability.

30. **Institutional reform and coordination.** As it was previously mentioned, inter-agency fragmentation has made it more difficult for Sri Lanka to respond to complex threats, such as cyber incidents and Easter attacks (Gunaratne, 2014). It is crucial to have a centralised, cooperative national security authority with well-defined responsibilities and oversight procedures. Defence, intelligence, law enforcement, disaster management, and civil society input must all be able to be integrated into this body. To further enhance accountability and sustain preparedness, frequent training, capacity building, and institutional audits should be carried out (Dissanayake, 2020).

31. **Incorporation of data and technology into the security-related apparatus.** Essential data, surveillance, and artificial intelligence advancements have the potential to greatly improve threat detection and situational awareness, but their application needs to be controlled by strong legal frameworks. Technology must be used in ways that preserve privacy, guard against misuse, and bolster democratic oversight; it should not take the place of human decision-making (Brewster, 2013).

32. **Incorporate resilience and adaptability.** Threats are changing quickly, and conventional responses are becoming more and more difficult to handle due to pandemics, climate change, and hybrid warfare. Foresight tools like scenario planning, early warning systems, and adaptive policy-making mechanisms must therefore be included in the framework (Kumar, 2018). An antiquated or inflexible security system runs the risk of losing its effectiveness when faced with new and evolving threats.

33. **Role of civic engagement and public trust.** Without the active involvement of an informed and capable populace, security cannot be attained. National stability is based on inclusive discourse with communities, transparency in governance, and public trust in institutions (Chandran, 2019). As they serve as force multipliers in preventing radicalisation, disinformation, and lawlessness, efforts to promote security awareness through media literacy, community policing, and education should be increased (Bajpai and Hagerty, 2016).

34. **Regional and international cooperation through alliances in common interests.** Because of its central location in the Indian Ocean, it plays a vital role in maintaining regional stability. In a geopolitical environment that is becoming more contested, strengthening alliances, taking part in cooperative exercises, and exchanging intelligence with friendly countries can increase national capability and communicate strategic alignment (Brewster, 2013).

CONCLUSION

35. In terms of revising its national security strategy, Sri Lanka is at a turning point. As illustrated throughout this paper, the nation's security issues now encompass a complex matrix of non-traditional risks, from cyberwarfare and transnational terrorism to climate change and economic vulnerabilities (Bajpai and Hagerty, 2016; Kumar, 2018). A transformative strategy that combines resilience in soft power, inclusive governance, and hard security capabilities is needed to address these issues.

36. A security framework that is both context-specific and globally informed is required due to Sri Lanka's strategic location in a geopolitically sensitive region and the legacy of civil conflict. To ensure that security is a collaborative effort involving civil society, governmental institutions, and international partners rather than being synonymous with state control, such a framework must be flexible, open, and participatory (Sumanthiran, 2018; Chandran, 2019).

37. Strong interagency coordination, technological and strategic investment, democratically based legal reforms, and enhanced regional cooperation are all essential components of creating this comprehensive model (Gunaratne, 2014; Dissanayake, 2020). Importantly, incorporating environmental readiness, minority representation, and public awareness will improve long-term national cohesiveness and resilience.

38. At the end, national security in the twenty-first century needs to be viewed as a dynamic, multifaceted concept. Sri Lanka must create an integrated, inclusive, and future-ready security architecture in order to protect its sovereignty, maintain social stability, and advance sustainable development. This plan will put the nation in a position to not only address current threats but also foresee and lessen new ones, guaranteeing a safe and prosperous future for all of its residents (Brewster, 2013; Katzenstein, 2005)

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ANALYSE THE IMPACT OF AI AND AR TECHNOLOGIES INTEGRATED FLIGHT SIMULATOR ON THE BASIC MILITARY PILOT TRAINING OF CESSNA AIRCRAFT IN SLAF

**Squadron Leader MDCES Jayarathna MIT, MSc (Def & Strat Stu), Bsc in MIS,
psc**

ABSTRACT

As aviation evolves, the integration of advanced technologies into pilot training is becoming imperative. Sri Lanka Air Force (SLAF), as a key national defence entity, requires modern solutions to maintain its operational readiness and meet international standards in pilot training. Even though traditional methods are valuable, currently they are caused to raise different challenges in time management, cost management and maintaining standards in training environments with respect to the current position SLAF holds. This paper investigates the impact of Artificial Intelligence (AI) and Augmented Reality (AR) integrated flight simulator on SLAF's Cessna aircraft pilot training, highlighting their potential to enhance training effectiveness. The study addressed the existing knowledge gap by overcoming challenges such as a stressful training environment and limited time constraints through the integration of AI and AR technologies in a novel modern Cessna flight simulator for pilot training in SLAF. The study highlighted that the simulator with the integrated technology significantly enhances training effectiveness and overall performance in the SLAF. The findings suggest that AI and AR embedded simulators improve operational preparedness, skill acquisition, and pilot safety. Further, this study advocates for strategic investments in AI and AR based simulators as a cornerstone of SLAF's pilot training curriculum, aiming to produce highly skilled, confident, and adaptable military pilots capable of excelling in dynamic operational environments.

Keywords: AI, AR, flight simulators, military aviation, aviation technology

1. INTRODUCTION

Sri Lanka Air Force (SLAF) is the guardian of sky who plays a key role in safeguarding national security by protecting airspace of the nation. To effectively accomplish its missions, SLAF employs various verity of aircraft, such as fighter jets, Helicopters, reconnaissance aircraft and transport aircraft. Even though, the deployment of airpower

is inherently costly, it is a vital investment in safeguarding the nation's security and sovereignty which cannot be dismissed due its higher cost. Further, according to SLAF Military Doctrine, (2022), SLAF has been playing a vital role in UN peace keeping missions over the years in different countries under different contingent, performing air operation while obtaining operational flying experience in foreign territories. Flying training comes with an expensive budget and it is a time intensive process. It requires highly expensive and limited equipment. Aircraft and relevant resource maintenance, technical crew management, overseeing professional training staff and educating and training the pilots are most challengeable parts of the military pilot training.

1.1 Background of the Study

Simulator training is a key segment of the pilot training. According to Anifah,et al.(2024) Indonesia Pilot Academy of Banyuwangi uses ALSIM, Redbird TD2 and FMX 1000 simulators to provide basic flying practices, improve pilots' capabilities, and maintain their skills to orient pilots for actual scenarios. According to the Jois, (2020), AI and AR technologies are used to develop most advanced flight simulators with enabling motion effects to improve and practice flying procedures in high realistic virtual environment. According to the Cessna Aircraft Company (1977) emergency procedure, by using them, it is allowed to evaluate the performance of the trainee and develop their skills and capabilities with identifying their weaknesses and strengths. Furthermore, it is allowed to build up a highly realistic virtual environment by providing additional information about the status of aircraft, the status of weather, the supportiveness of decision-making, and the objectives of the mission around the training, which are mostly similar to the actual scenario.

1.2 Problem Statement

This study emphasizes the versatility and effectiveness of a modern flight simulator, which is capable of providing a virtual environment for pilot training at the military level to improve the expected capabilities and skills of trainees within the given limited flying hours and training sorties and in a stressful environment. Further, it is highly dependent on the comprehension of potential benefits and challenges with regard to integrating modern simulators into the goals of present pilot training. The in-depth analysis of this research topic will provide a sound understanding of theoretical and practical aspects for the effective use of contemporary technology to address issues and develop products to meet the SLAF's needs for basic pilot training.

By studying research papers which were relevant to this topic, it was observed that those studies were not done with the following factors;

- A. AI and AR-integrated motion features
- B. Training in a stressful environment
- C. Training in limited flying hours

In this research, it is planned to focus on the above three factors. Because SLAF pilot training is done in a stressful environment with limited time. Further, it is planned to analyse how motion features (developed by using AI and AR technologies) impact the other two factors.

1.3 Research Objectives

The research objectives of this study are as follows:

- A. Identify the impact of AI and AR technologies integrated modern flying simulator on military pilot training of Cessna aircraft in SLAF.
- B. Evaluate the effectiveness of the flight simulator (developed by using AI and AR technologies) of Cessna aircraft on stressful training environment.
- C. Evaluate the effectiveness of the flight simulator (developed by using AI and AR technologies) of Cessna aircraft in optimizing training within constrained flying hours.

1.4 Research Questions

Three research questions derived from the objectives are as follows:

- A. What are the impacts of integrating AI and AR technologies into modern flight simulators on military pilot training for Cessna aircraft in the SLAF?
- B. In what ways do modern flight simulators help to manage the time-constraint challenges of Cessna flight training in the SLAF?
- C. In what ways do modern flight simulators help to manage stressful environments during Cessna flight training in the SLAF?

1.5 Scope

The scope of this research is to study essential features of the modern flight simulator developed by using AI and AR technologies for Cessna

aircraft and how those features affect military pilot training in limited flying hours in a stressful environment, with the goal of enhancing training outcomes for SLAF.

2. METHODOLOGY

In this section, conceptual framework, hypothesis, research population, sampling technique, sample size and data analysis tools are presented. Furthermore, the research design of the study is formulated as follows:

- A. **Research Philosophy:** Positivism has been adopted to gain the benefits through innovation and share outcomes, leading to impactful sustainable results.
- B. **Research Approach:** A deductive approach has been used to examine hypothesis and correlations.
- C. **Research Strategy:** Survey strategy has been used to gather data from flying instructors and pilots regarding Cessna flying training in SLAF.
- D. **Research Choice:** A mixed-mode has been used to combine data collected through questionnaires and interviews.
- E. **Time Horizon:** A Cross-sectional perspective has been applied in this study.

2.1 Technique and Procedure

The study employed both data collection and analysis techniques. Primary data were obtained through structured questionnaires and interviews while secondary data were gathered from existing literature, including previous research studies, peer-reviewed journal articles, online publications and official doctrine of the Sri Lanka Air Force.

2.2 Conceptualisation The conceptual framework has been developed to achieve the research objectives by addressing the proposed hypotheses. It aims to identify how the integration of AI and AR in modern flying simulator impact to military pilot training of Cessna aircraft in SLAF to overcome challenges associated with stressful training environment and limited flying hours.

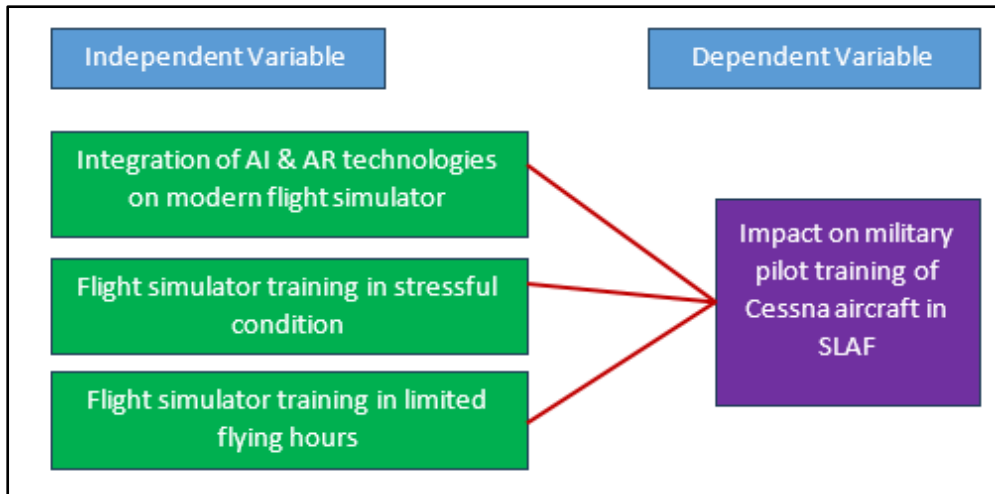


Figure 1: Connectivity of independent variable and dependent variable

Source: Originated by the researcher

2.3 Hypothesis

Researcher has been developed three hypotheses based on conceptual framework and prove the relationship between three independent variables and dependent variable. Three hypotheses are shown below:

- A. **HA1:** Use of AI & AR technologies integrated modern flight simulator is impact on military pilot training of Cessna aircraft in SLAF.
- B. **HA2:** Under stressful conditions, an AI and AR-integrated modern flight simulator helps increase the productivity of military pilot training of Cessna aircraft in the SLAF.
- C. **HA3:** An AI and AR-integrated modern flight simulator helps to overcome the challenges posed by limited flying hours in military pilot training of Cessna aircraft in the SLAF.

2.4 Research Population

As of 01 February 2024, the research population includes active service pilots, retired pilots and flying cadets who flew Cessna aircraft in SLAF.

2.5 Sampling

Samples for the interviews were selected by using Morgan table from Subject Matter Experts (SMEs), Flying instructors, qualified pilots and flying cadets of the flying squadrons of the Sri Lanka Air Force. Since the study population 125 (N) it gives sample size of approximately 95 participants. The equation is as follow:

$$S = X^2 \times N \times P (1-P) / d^2 (N-1) + X^2 \times P (1-P)$$

Where:

S = required sample size, chi-square value for 1 degree of freedom at the desired confidence level (for 95%, $X^2=3.841$)

N = 125

P = population proportion (0.5)

d = margin of error (0.05 for 5%)

2.6 Data Collection and Analysis

Primary data were gathered through a simple random sampling technique by distributing questionnaires electronically via Google Forms to the target population. The quantitative data gathered were then statistically analysed. Likert questionnaire and structured questionnaire were prepared with supervision of Subject Matter Expertise (SME) of SLAF with aligning conceptual framework. The data processing steps included coding, classification, numbering and editing. Further interviews were conducted exclusively with qualified flying instructors who train trainees on Cessna aircraft at FTW, SLAF Academy China bay. These interviews primarily focused on the effectiveness of a modern simulator in flight training to optimize available time in a stressful training environment.

3. RESULTS

This section presents the findings derived from the analysis of data collected through questionnaires and interviews. Furthermore, it discusses the tested hypotheses and examines the relationships between the independent variables and the dependent variable.

3.1 Findings

The researcher collected data from 104 respondents. Out of it 100 data were collected through questionnaire and which are used to quantitative analysis. According to Table 1, all the questions of questionnaire were run through the reliability test and received

a value of 0.866. The given value is greater than 0.7 (standard values for Cronbach alpha). Hence, it is realized that the survey results can be accepted as internally consistent and reliable.

Table 1: Reliability Statistics of the questionnaire

Cronbach's Alpha	N of items
(a)	(b)
0.866	16

Source: Survey Data, 2024

For this research, pilots of the SLAF are selected to the research population. Further a significant portion of the population 65% are having experience in flying simulator.

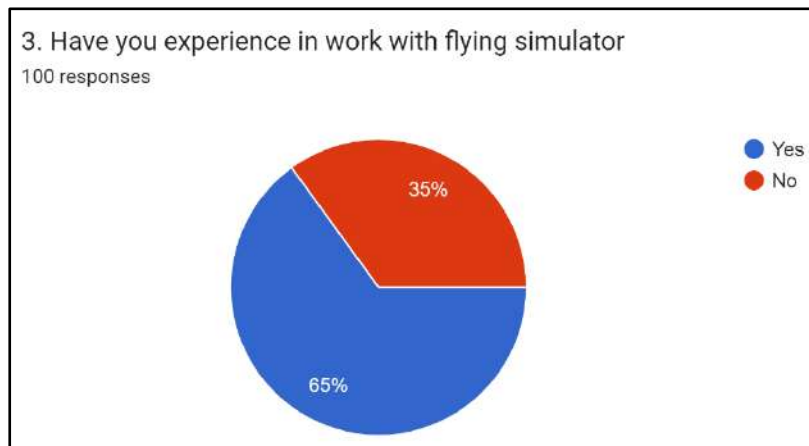


Figure 1: Flying simulator experience

Source: Originated by the researcher

3.2 Reliability Analysis

Table 2: Reliability Analysis.

Variable	Cronbach's Alpha
(a)	(b)
Importance of AI and AR technology	0.788
Stressful condition	0.759
Limited flying hours	0.762

Source: Originated by the researche

According to Table 2, all the questions were run through the reliability test based on variables and received values are greater than 0.7 (standard values for Cronbach alpha). Hence, it gives a close value of 76% on the reliability of the questionnaire with a higher inter item correlation.

Table 3: Correlation Analysis

Correlations					
		DV	IV1	IV2	IV3
Pearson Correlation	DV	1.000	0.746	0.744	0.728
	IV1	0.746	1.000	0.783	0.739
	IV2	0.744	0.783	1.000	0.818
	IV3	0.728	0.739	0.818	1.000
Sig. (1-tailed)	DV		0.000	0.000	0.000
	IV1	0.000		0.000	0.000
	IV2	0.000	0.000		0.000
	IV3	0.000	0.000	0.000	
N	DV	100	100	100	100
	IV1	100	100	100	100
	IV2	100	100	100	100
	IV3	100	100	100	100

Source: Originated by the researcher 2024

Table 3 presents the results of the correlation analysis. As shown, all independent variables (IV1, IV2 and IV3) exhibit a strong and statistically significant positive correlation with the dependent variable (DV). Moreover, the independent variables themselves demonstrate strong correlations by suggesting the presence of potential multicollinearity among them.

Table 4: ANOVA table

ANOVA^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	31.681	3	10.560	57.510	0.000 ^b
	Residual	17.629	96	0.184		
	Total	49.310	99			

Source: Originated by the researcher 2024

According to ANOVA result (Table 4), which indicate that the regression model is statistically significant ($F(3, 96) = 57.510, p < 0.001$). This suggests that the independent variables (IV1 (Importance of AI and AR technology), IV2 (Stressful condition), IV3 (Limited flying hours)) together explain a significant portion of the variance in the dependent variable (DV (Impact on military pilot training of Cessna aircraft in SLAF)). As shown, the high value of the F-statistic and low p-value confirm that predictors in the model are effective in explaining variation in the dependent variable; the probability for those results to occur by chance would be very low.

According to the above facts explained, the relationship between the independent variables and dependent variables is statistically significant. This has proved the hypothesis that AI and AR integrated flying simulator is useful to overcome challenges in stressful environment during Cessna flying training program in SLAF in assigned limited time period.

3.3 Interview Results

A. Use of AI & AR Technologies Integrated Modern Flight Simulator: Introduction of AI and AR in flight simulators further enhances Cessna training at SLAF through the simulation of adverse conditions and emergency procedures. It allows to pilots to experience realistic scenarios safely while improving efficiency, productivity and preparedness during modern simulator training. Advanced simulators in addition to conventional methods, enable pilots to practice critical situations and refine their skills, thus assuring better response capabilities in real flights.

B. Use A Modern Flight Simulator Under the Stressful Environment: AI and AR in the flight simulators provide additional hours of training to the trainees for better performance in stressful environments and enhancement of situation-handling capabilities. These enable the trainees to improve their skills and practice those procedures which are critical, thus enhancing readiness and confidence. This comprehensive training approach would be support to handle real world scenarios and excel in military pilot's roles.

C. Training Time Management by Using Modern Flight Simulator: AI and AR technologies of flight simulators improve training in Cessna aircraft by increasing military pilots' acquisition and readiness. Real-time performance analysis and personalized feedback have allowed the trainees to instantly understand mistakes and correct them, hence faster and quicker. In such a way, advanced technology will make hours maximally effective and prepare pilots for real flying.

D. Impact on Military Pilot Training of Cessna Aircraft: AI technology allows real-time analysis, immediate feedback in simulators and thereby lets a pilot know exactly where their mistake has occurred and how it can be corrected. This considerably speeds up learning and improves the acquisition of skills in an effective manner.

E. Integration of AI and AR in Flight Simulation: The evaluation of AI and AR embedded simulators in SLAF's Cessna training highlights their benefits and limitations. While simulators offer realistic training, safety and cost savings, concerns include differences with real-life conditions and the impending replacement of the Cessna fleet.

F. Reducing Pilot Stress through AI and AR-Integrated Simulators: AI-AR integrated simulators reduce stress in SLAF training and improve efficiency. It provides a safe and controlled environment to practice procedures, scenarios and emergencies. Such simulators explain flight profiles, enhance real-life performance and give reason for Global Advanced Training Practice. They allow safe practice of challenging manoeuvres and weather conditions, ensuring better preparedness and training efficiency.

G. Maximizing Practice Time Using Advanced Flight Simulators: Simulators accelerate the learning process and allow trainees to rehearse complex manoeuvres on the ground. In addition, they will be able to make the most out of in-air practice due to limited availability of aircraft.

From the findings of the research study, it has been identified that the modern flight simulators integrated with AI and AR are highly effective for providing Cessna flight training in the SLAF. Simulators help to increase productivity and quality of training by offering supplementary flying practice time under a considerably low cost. Moreover, when it comes to stress management, an important aspect of in-flight training, modern simulators can reduce the level of stress through efficient simulation of critical scenarios.

3.4 Core Argument

Based on the data analysed qualitatively and quantitatively, it is evident that the argument put forward through literature aligns with the findings of the research. Thus, research findings confirm that implementing an AI and AR integrated flight simulator can resolve the challenges in a stressful environment within a limited time period.

Moreover, the research finding identifies how modern simulator technology can meet higher standards of SLAF flight training on par with international best practices.

4. RECOMMENDATIONS AND CONCLUSION

Following recommendations have been derived from this research by researcher.

A. It is recommended that the SLAF fully integrate AI and AR technologies into Cessna flight simulators as a strategic enhancement to pilot training program.

B. It is strongly recommended that the SLAF expand the breadth and scope of its training programs through increased utilization of AI and AR-powered flight simulators. Given their proven effectiveness in enhancing pilot performance, these technologies should be leveraged to provide extended training hours, simulate high-stress scenarios and improve critical decision-making skills.

C. It is recommended that the SLAF prioritize the implementation of AI and AR-integrated technologies within the Cessna flight simulator program to elevate the standard of pilot training and boost operational effectiveness. These advanced simulators offer enhanced training capabilities, real-time performance analytics and personalized feedback, enabling faster skill acquisition and improved pilot readiness.

D. It is strongly recommended that flight simulators be integrated as a complementary method of training in order to enhance practical skills more effectively. These simulators can enhance in-aircraft training considerably by providing additional opportunities for practice on a variety of flight profiles and emergency procedures in a controlled environment, thus greatly enhancing the proficiency and readiness of pilots.

E. To maximize the return on investment and ensure long-term utility, the SLAF should invest in a versatile and adaptable simulator platform capable of accommodating future aircraft models and evolving training requirements.

F. To optimize pilot training, reduce stress and enhance overall flight safety, the SLAF is strongly recommended to invest in and expand the utilization of AI and AR-integrated simulators. By providing a safe, controlled environment for practicing a wide range of flight scenarios and emergency

procedures, these simulators offer significant advantages in improving pilot proficiency and operational readiness.

G. It is recommended that the SLAF implement a structured and comprehensive training regimen focused on developing highly competent and adaptable combat pilots. This program should prioritize the cultivation of effective decision-making, rapid response capabilities and heightened situational awareness, particularly in high-pressure and combat scenarios.

H. It is recommended that the SLAF prioritize strategic investment in AI and AR-integrated flight simulators to advance the effectiveness of military pilot training. These cutting-edge technologies enable the creation of highly realistic and adaptable training environments that significantly enhance pilot proficiency and operational readiness. By leveraging the combined strengths of AI, AR and human instruction the SLAF can optimize training outcomes and develop a cadre of highly skilled pilots equipped to perform effectively in complex and dynamic operational settings.

5. CONCLUSION

This research is focused on to identify Impact on military pilot training of Cessna aircraft in SLAF by using AI and AR integrated modern flying simulator in stressful training environment within the limited time period. Focusing on those main factors, it was able to identify how the modern simulator was effective in improving productivity to maintain international standards of flying training.

The research study used both primary and secondary data and qualitative and quantitative data within the framework. The thesis collected qualitative and quantitative data through google form and interviews with subject-matter experts and a questionnaire developed around the research objectives and distributed to 104 respondents. It can be concluded that the challenges of flying training can be overcome by implementing modern flying simulator in SLAF.

The integration of AI and AR technologies into modern flight simulators presents competitive advantages to uplift the SLAF training standards to the next level. With realistic, adaptive and data-driven training conditions of Modern simulators, can rapidly enhance operational preparedness, pilot skills and air safety. While traditional training methods are valuable, it's essential to invest in AI and AR integrated simulators to meet the emerging demands of flying in modern aviation. That would allow the SLAF to build a corps of highly skilled and adaptable airmen who will do exceptionally well in any operational scenario by effective amalgamation of human expertise,

advanced technology and structured training. The findings of this research strongly advocate for the extensive adoption and continuous development of AI and AR-integrated flight simulators as a key component of the SLAF's pilot training curriculum.

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THE EFFECT OF DISRUPTIVE TECHNOLOGIES TO WARFARE AND CHALLENGES TO SMALL STATES

**Brigadier GDJC Prematilake USP, MDS (Kelaniya), Msc (Def & Start) (India)
PGDM (OUSL), BA Def (Hons) (KDU), ndc, psc (India), psc (Sri Lanka)**

ABSTRACT

This study aims to explore the disruptive technologies and its revolutionary impact on the defence domain, with a special emphasis on how technological innovations can inspire policies, doctrines, strategy development, force structures and operational and tactical settings in a country. It is explained through the findings of empirical studies. In the literature the technological changes in relations to Moore's theory is explained. Although there are a number of disruptive technologies, the scope of the study is limited to cyber, autonomous and AI, Directed Energy Weapons (DEW) and hypersonic weapons. It analyses how small states should adopt disruptive technologies gradually, having addressed human security issues first. There, it is highlighted the requirement of digital transformation of forces. A comparison studies has been done with Israel, South Korea and Singapore to learn lessons for Sri Lanka. Finally, the article summarizes some conclusions concerning the dynamic character of the interrelationship between the development of defence strategies and technology innovations for Sri Lanka. The recommendations are from the defence and human security perspectives.

Keywords: Disruptive Technologies, Cyber, Autonomous, Drones and AI, Human Security, Small States

INTRODUCTION

In 2008, Russia coupled cyber-attacks with the ground invasion to paralyze command, control and communications systems of Georgia, for the first time in history. USA and Israel launched the Stuxnet virus to prevent uranium enrichment by Iran (Rabkin and Yoo 2017). The AI wave, the newest technologies really opened a 'disruptive' shift in warfare with a rapid change of existing face of doctrines of warfare. This also includes advance technologies like robotics, additive manufacturing (3D printing), quantum computing, directed energy, and other 'disruptive' technologies (Raska 2022).

Genesis of Disruptive Technologies

Historically the introduction of the machine gun, airplane, and submarine prior to World War I and internal combustion engine, improved aircraft, radio, and radar

thereafter made possible revolutionary leaps in long-range, highly mobile operations such as Blitzkrieg were considered as game changers. The development of nuclear weapons subsequently with ballistic missiles marked possibly the most profound revolution in military affairs (RMA) to date (Fitzsimonds, Tol, and A 1994). The Gulf War displayed a remarkable era of new Revolution of Military Affairs effects (Maurer 2023). Disruptive technologies are the present culmination and transformation of technologies from the industrial age across information-age warfare towards the 'automation-age warfare' (Raska 2022, p.89). IT-driven RMA is interpreted as 'disruptive' military innovations or the sixth RMA wave by scholars due to its wider influence by ICT (Pelosi and Roma 2010). The concept of disruption was first introduced by Clayton Christensen, a Harvard Business school professor, in his book 'The Innovator's Dilemma'.

Theoretical Foundation

Clausewitz had given less importance to technology as a variable in his analysis of war (Chin and Chin 2019). However, the industrial revolution, advent of the nuclear technology and post-cold war technological advancements changed the character of war that include doctrines, force levels, strategies and tactical aspects as well.

Moore's Law and Disruptive Technologies

Moore's Law was first introduced by Intel co-founder Gordon Moore in 1965. Moore's Law is the most applicable to understand disruptive technologies at present, which describes that the number of transistors on a microchip doubles approximately every two years. It plays a significant role in driving disruption in the technology industry (Roser Max et.al, 2023). This is the base of the development of smart phones, internet, cloud computing and social media. As per Moore's Law this technology revolution will be transferred to the next higher level on quantum computing and carbon nanotubes continuing the pace of the revolution. Disruptive technologies have radically changed almost all the commercial, medical, education, transportation, finance including defence and security in an unprecedented speed.

Key Characteristics of Disruptive Technology

- **Transformational Impact.** Disruptive technologies bring about a paradigm shift in all affairs including military operations.
- **Obsolescence of Existing Systems.** These technologies can render existing technologies, weapons, platforms, or methods ineffective, necessitating new investments and adaptations.

- **Rapid Advantage.** They provide a significant advantage to early adopters, potentially shifting the balance of power in military engagements.
- **Integrate Challenges.** The adoption of disruptive technologies requires extensive changes in training, doctrine, force structures, and logistics.

Disruptive Technologies and Integration to Warfare

Intervention of disruptive technologies to military, made a revolution in geopolitical competition. It enables to enhance the precision, improve battlefield detections, and help in more precise in decision making. The hyperspectral imagery, computational photography, advance compact sensor designs blended with AI architecture, generally supersede traditional battlefield barriers. New secure communication platforms based on quantum computing and quantum cryptography provide base for a threshold to the next generation hi-tech warfare (Kasapoğlu and Kırdemir 2019). In that sense, Sri Lanka's defence domain requires a technological revolution in all spheres; physical, conceptual and moral.

As a wholesome approach, disruptive technologies can be utilized for all the sectors in the society like healthcare, education, agriculture, financial and economic sectors, in addition to defence. However, defence sector is more significant in the global context due to its competitive application. In this research, following key areas are considered:

- Cyberwarfare.
- Unmanned weapon systems/ drones and autonomous weapon systems.
- Artificial Intelligence (AI).
- Hypersonic weapons.
- Directed Energy Weapons (DEW).
- Biotechnology.

Analysis

How Disruptive Technology Causes Changes on Doctrine, Defence Strategies and Force Structure

Technological realizations come into doctrines after years of its practical testing. First tank introduced in 1917 but Blitzkrieg came into warfighting doctrines decades after that (Fitzsimonds, Tol, and A 1994). However, the disruptive technologies have a great potential to transform basic notions of defence strategy with a rapid speed which is justified through Moor's Law as well.

In the recent experiences depicts, it has the ability to change correlation between offensive and defensive military strategies or the inter-relationship of range, mass and speed.

Use of cost-effective drones witnessed in the Ukraine Russia war, utilized at minimal cost and with little collateral damage has been seen as a trend. Hence, such an approach critically compels military forces to re-think about doctrines, force structures and way of fighting. One fourth of the US combat troops will be replaced by Unmanned Ground Vehicles (UGV). Russian Military Industrial Committee plans to generate 30% of the Russian combat power in 2030 from a pool of remotely controlled (i.e: Uran 9) and autonomous military robotic platforms(Kasapoğlu and Kırđemir 2019). These changes essentially transform the existing doctrines, force structures and strategies of most of the countries sooner than later.

Areas That Influenced the Change of Doctrine

- **Change the Character of War.** With disruptive technologies, the character of war is continue to be reshaped with the technology, strategies, domains, legal and ethical considerations and by forces outside the state-centric systems(Heinl 2015).
- **Multi-Domain Operations (MDO).** RMA and disruptive technologies integrate activities across land, sea, air, space and cyberspace including social media. USA authorized offensive cyber operations. China's doctrine accommodated cyber as a force.
- **AI-enabled Information Operations, Psychological Operations and Political Warfare.** World dominant powers conceptualize their disruptive technologies to further their political strategies to pursue national interests. AI enabled information operations, disinformation and political warfare are augmented with contemporary technological advancements.
- **Algorithmic Warfare.** Algorithmic warfare is a revolutionary extension of information warfare. It is based on extensive growth in computer processing power and machine learning capabilities. Management of security related big data, with large datasets have led to open new areas of training and operational doctrines of militaries. As per records in 2013 the world produced 4.4 zettabytes of data. (A zettabyte is one followed by 21 zeros.) By 2020, it was 44 zettabytes and, by 2025, expected to have 163 zettabytes(Kasapoğlu and Kırđemir 2019).

- **Cloud Services and Data Security.** US store their data in private companies like Google and the contract exceeds 10 billion USD for Pentagon's cloud services. Adversaries can use these data to attack individuals, groups, organizations and states.
- **Requirement of Joint Doctrines.** To gain information superiority and counter threats on information domain, Joint Concept for Operations and joint strategies are required.
- **Whole of Nation Approach.** Information operations and AI driven threat cannot be subdued only by military approach. It requires private-public partnership and whole of nation approach.
- **Augmented Network-Centric Warfare.** RMA transformed the warfare in to network centric and disruptive technologies further augmented with real-time information utilizing advanced communication networks to share real-time data, improving decision-making and situational awareness.
- **Alliances, Partnerships and Joint Exercises.** Strengthening commitments to mutual defense treaties, collaborative defence initiatives and bilateral and multilateral exercises improve interoperability and technology transfers of militaries.

Force Structures

- **C4ISR Architecture.** AI controlled robot can perform as an entity of a larger force within a unified C4ISR architecture that can change existing force structures(Kasapoğlu and Kirdemir 2019).
- **Drone Swarms on Air Platforms.** In the air platform, AI-based disruptive technologies enhance their capabilities in 6th generation aircraft, which will surely operate alongside with their autonomous unmanned systems, and will acquire capability of launching drone swarms and carry directed energy weapons. This can challenge traditional capabilities of air platforms.
- **Cloud Based Sensor Operating Systems.** Future air warfare and air power will focus on information dominance through a network of air, space, and cyber domain-based sensors. US Air Force having identified the change they

- are to operate air craft from data based on cloud-based sensors, as per their 2030 flight plan(Kasapoğlu and Kırdemir 2019).
- **Joint Operations Architecture.** Disruptive technologies encourage joint commands that combine elements from different branches of the military to enhance coordination and effectiveness at operational and tactical levels.
- **Enhanced Mobility and Precision.** Incorporation of unmanned vehicles (UGVs, UAV, UMV) and robotic systems has transformed operational doctrines, emphasizing greater mobility, precision, and reduced risk to personnel.

Strategies

- **Human Security Strategies.** Due to extensive use of AI, it will create a major economic and workforce shifts in the next decade. A relative shift of security phenomena also will take place. This can cause the changes in the future security doctrinal strategies.
- **Surveillance Strategies.** Using AI systems for racial profiling can drastically augment the surveillance activities. This can reduce use of human sources in surveillance and tracking. Further incorporation of DNA records can lead to more precision in intelligence operations.
- **Transformation from Surveillance into Strike Platforms.** 1980s role of UAVs have been transformed rapidly into autonomous strike platforms. Embedded with expanding sensors technology and GPS technologies serves as force additions for robotic warfare which significantly in the process of changing strategies.
- **Challenges to Traditional Air/Naval Platforms.** Due to the advancements of disruptive technologies, conventional critical enablers, like aircraft carriers and air bases, are to face pressing risks stemming from both kinetic and non-kinetic attacks on all domains including cyber and space.
- **Air Dinal and Limitations on Non-Stealth Technologies.** Sophisticated area denial, Air Defence capabilities, advanced SAM systems (surface-to-air missile) and electronic warfare (EW) capabilities have created lot of limitations for air domain to operate. Use of none-stealth aircraft will have many limitations in future.

- **Rapid Growth of UAVs.** USAF had only 170 UAVs in 2001, but by 2014 its' inventory has gone up to 11,000 thereby; making UAVs as the largest growing military assets in the inventory. This has drastically changed the surveillance and attack strategies of militaries. Similarly, there is a growing demand to make counter drone systems in the world. UAVs have become the principal weapon systems in counterterrorism operations in Pakistan, Somalia, Yemen and Libya(Kasapoğlu and Kırdemir 2019). 95% of the intelligence on ISIS comes from drone imagery.

Risk Factor Analysis

- Autonomous robotics is the next generation of weaponised technology after drones. This will be extremely difficult to control and small states will have a challenging future(Heinl 2015).
- Autonomous military system with their nature of asymmetry can become lone-wolf type killer machines for strategic targets.
- AI based decision making can have a huge social and political impact through justice, law enforcement, education and recruitment related activities. There may be algorithmic errors that can cause security risk in critical infrastructure, defense, military, healthcare and financial systems.
- Fully AI based Offensive Cyber Operations can cause detrimental effects and heating situations among states. Availability of sophisticated tools in black markets, will increase potential hostile actors on the cyber domain related to weaponization of cyber domain.
- Striking a careful balance between innovations and ethical considerations will be challenging with fast moving technology.
- Politically motivated cyberattacks to compel states to impose will(Tan 2019,p. 160).
- Instead of direct military confrontation, economic, cyber and proxy actions are likely to play deciding roles with the intervention of non-state actors.
- Disruptive technologies in future will enable small states and non-state actors to acquire technology for low cost like swarm tactics through cheaper drones, AI led weapon systems, which can create a credible deterrence to countries.

Understand Advanced Small States.

There are successful small states like Singapore, Israel and South Korea, although having relative asymmetries similar to Sri Lanka; of their location, geography and size; and natural resource constraints; yet managing disruptive technologies and practice effective defence networks. Most of these countries have first enhanced people's living standards with technology. This has reduced human insecurity and allowed for innovations, skilled labour force and robust private sector to invest on research and developments. Following chart depicts the issues with Sri Lanka and the ability of Israel, South Korea and Singapore to acquire technology to defence domain.

Comparison of Advanced Small States with Sri Lanka

	Israel	South Korea	Singapore	Sri Lanka
Geostrategic Predicaments	Lack of strategic depth; Resource asymmetry	Profound strategic interests and involvement of major powers	location, size, lack of natural resources, physical limitations; Asymmetries in demographic factors; strategic interests and involvement of major powers	Size and Resource asymmetry. Strategic interests and involvement of major powers
Defence Industrial Base	Advanced defense industry. High-tech arms exports	High-tech civil-military industries	Advanced “defence ecosystem”, High-tech civil-military industries	Primitive Defence industry base.
Defense Management Capacity	RMA-based military modernization programs	RMA-based military modernization programs	RMA-based military modernization programs	Imports oriented military programs
Global Cyber Security Index	91	99	99	59(Below average)
Per Capita Income \$	58,270	36,194	84,734	3833
Digital Adoption Index (2016)	7.878	8.578	8.705	4.759

Source: Developed by the author with data from Rasaka (2015)

Sri Lanka's Technological Asymmetry:

- Sri Lanka has inherent barriers like organizational rigidity, bureaucratic politics, non-flexible organizational cultures and less government patronage for tech innovations.
- Growing cyber deterrence by powerful countries to influence the strategic policies of small states, will be a greater challenge.
- To maintain non align policies will have a challenge with this new threat on cyber compelling and cyber deterrence.
- Absence of legal and policy framework to protect the digital rights of people like EU's General Data Protection Regulation (GDPR).
- Technological competition of India and China directly affects to Sri Lanka as the country is within the technological interests of those countries and the state of disruptive technologies will affect the regional balance.
- Lack of broader strategic understanding of the global security dynamics, emerging threats and technological advancements in the global context.

RECOMMENDATIONS AND CONCLUSION**Recommendations to Sri Lanka.**

Visionary countries quickly take actions to cope up with everchanging technologies to be in par with technology and state affairs. UK's All-Party Parliamentary Group on Artificial Intelligence", and proposed 'Algorithm Accountability Act' to audit algorithm functions of USA are few of them(Kasapoğlu and Kirdemir 2019).

Sri Lanka cannot afford to most of the next generation technologies due to lack of funds, human capital and national attitude. The best option for Sri Lanka to use disruptive technologies are to enhance the human security and economic development. It will help to minimize emerging security problems too.

Defence Sector

- a. Sri Lanka's strategic and organizational culture and strategic adaptability should be transformed to embrace the required technological changes to the defence domain.
- b. Operational adaptability can be achieved through Joint doctrines, joint training doctrines, interoperability capabilities, and investing on skilled force.
- c. Sri Lanka needs to develop and establish reliable strong data links to work on AI powered applications on defence domain.
- d. Build effective public-private partnerships; for research projects in the ICT, AI, and robotics. These are the pioneers of military modernization programs in every country.
- e. Establish robust cybersecurity with professionals on technical forensics, human intelligence and signals intelligence.
- f. Sri Lanka should invest on selected autonomous technologies which can enhance the military capabilities on the areas of rescue missions, protection of armed forces and civilians, logistics, transportation, intelligence, law enforcement authorities and disaster mitigation.
- g. Identifying short-term and long-term national strategic risks, limitations, resource allocation priorities, and reconsidering national security conceptions for next five years.
- h. Revising defence doctrine to include new missions, policies; establishing new branches within the military.
- j. Revising the curriculum of professional military education institutions and operational and tactical level exercises to accommodate technological changes.
- k. Digital defence should be improved as the sixth pillar in its overall defence strategy of the country.
- l. Legislation to protect from online threat similar to Protection of Online Falsehoods and Manipulation Bill of Singapore to guard against potential information manipulation and degradation.

- m. Establish backup systems at national level.
- n. Use AI for crime prediction and prevention.
- o. Establish digital identification system with the help of blockchain technology that can help personalize identification, displaced people management, disaster management and authenticity of social welfare programs.

General Recommendations

- a. Sri Lanka needs to establish a multi-disciplinarian researches center for selected disruptive technologies on emerging threat to minimize impacts.
- b. Sri Lankan society needs to enhance the digital literacy including digital financial literacy.
- c. Media literacy education, independent fact-checking, and transparency in communication to be enhanced to build resilience against adverse information operations.
- d. Use AI to identify and predict the spread of biological agents like pandemics and chemically harmful materials in the island to mitigate risks to human security.
- e. Use bio surveillance systems which can detect bacterium, virus or microorganism that can cause diseases. This can enhance human security.
- f. Use nano technology to create sensitive sensors for medical applications.
- g. Use blockchain systems for safer transactions and enhance the efficiency of financial process.
- h. Use digital voting j. Introduce e-governance systems on digital platforms to enhance the efficiency of services.
- k. Use IoT sensors to detect environmental hazards like conflagration, water pollution, oceanic hazards, deforestation and climatic variations.

CONCLUSION

Future threat factor and how to shape the battlefield will be dictated by the factors like effective synchronization of physical, informational, and cognitive battlefields within the backdrop of algorithmic warfare. The strategic planning concepts like center of gravity, fog of war, friction, capabilities of forces and factor of surprise will have to be re-designed with the change of technological factors like AI, big data, and robotics. The ability of a country to acquire such capabilities will decide the strategic advantages in future conflicts. This has drastically increased the global strategic competition not only in defence and security, but also in financial, economic and geo-political spheres (Rasaka 2019). The capabilities of ever-changing disruptive technologies will play as a crucial determinant in deciding greater military powers in the world in future. For a country like Sri Lanka has different options rather than investing on offensive capabilities; enhance defensive capabilities and reduce threats and roots for human security through technological acquisition.

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THE MARINE SCIENTIFIC RESEARCH REGIME UNDER THE LAW OF THE SEA CONVENTION: IDENTIFYING GAPS AND PROPOSING A WAY FORWARD FROM SRI LANKA'S PERSPECTIVE

**Captain JHCH Ranaweera RSP, USP, psc, MSc (D&SS), B Naval St
(Maritime Warfare) (Hons), JP (Whole Island)**

ABSTRACT

This essay critically examines the marine scientific research (MSR) regime under the United Nations Convention on the Law of the Sea (LOSC), tracing its historical evolution, significance to the mankind and specially to Sri Lanka, and legal framework across all maritime zones outlined in the LOSC. It identifies key gaps and limitations within the current MSR provisions of the LOSC and evaluates their implications. Emphasising Sri Lanka's strategic maritime interests, the essay proposes a forward-looking approach to enhance national capacity, regional cooperation, and legal framework in conducting and regulating MSR from Sri Lanka's perspective.

INTRODUCTION

1. The exploration of our oceans dates back to the dawn of humanity, with ancient navigators across the world mapping uncharted waters, and modern scientists discovering the secrets of the seas. Unveiling curiosity about the seas is as timeless as the existence of mankind (Ysem, 1995). Scientific research and technological innovations have predominantly contributed to human civilization (Zou and Telesetsky, 2021). Modern oceanographic research is believed to have commenced with the expeditionary circumnavigation voyage of the British dedicated oceanographic research vessel Her Majesty Ship (HMS) Challenger between 1872 and 1876, in which the voyagers discovered significant information about world oceans such as Marianas Trench in the Pacific Ocean and the mountainous Mid - Atlantic Ridge in the Atlantic Ocean (Zou and Telesetsky, 2021). The significant characteristic during these types of voyages was the unrestrained freedom to conduct marine scientific research (MSR). According to the Division for Ocean Affairs and the Law of the Sea, Office of Legal Affairs, United Nations (DOALOS) (2025), until the 1950s, it was the customary law that governed this field, and the absence of any international treaty to regulate MSR was highly felt when the world saw an increase in MSR after World War II. Specially, these MSRs aimed to explore and exploit ocean resources and military applications.

2. The international community was compelled to codify regulations related to MSR and United Nations Conference on the Law of the Sea (UNCLOS) I held in 1958 in Geneva was the first international event where MSR was considered (DOALAS, 2025). The Convention on the Continental Shelf (Article 5) which was among four Conventions adopted in the UNCLOS I, envisaged MSR elements accordingly. Gradually, the international laws and regulations of seas were developed and the 1982 United Nations Convention on the Law of the Sea (LOSC or the Convention) was adopted at UNCLOS III which also outlined comprehensive provisions of the regime for MSR. The LOSC provides a framework of rules for determining the rights and duties of States with respect to their use of maritime space related to MSR.

3. However, it is argued that the lack of a proper definition of the term ‘marine scientific research’ in LOSC has created ambiguity, for instance, in the light of military and hydrographic surveys, leading to significant gaps in the Convention (Bateman, 2004). There were significant controversies arose in the recent past with regard to some MSR operations conducted by Chinese vessels in Sri Lankan Exclusive Economic Zone (EEZ) as well. In the above context, this paper will explore the regime set out in the LOSC for the regulation of MSR from a zonal perspective, identify gaps and limitations in the LOSC framework, and also way forward on MSR framework from Sri Lanka’s perspective.

4. **Significance of MSR.** Although 71% of the Earth’s surface is covered by oceans, the vast majority of them remain under-researched (Huang and Yang, 2021). For instance, only 8% of the deep sea has been explored (Huang and Yang, 2021). World oceans are predominantly useful for life and mankind on the earth. The ocean is the home of the largest ecosystem on Earth. Approximately 17% of global edible meat production comes from oceans. Nearly 50-80% of the oxygen people breathe is produced at seas and huge amounts of carbon dioxide are absorbed by the seas. It controls the global climate as well.

5. Further, extracting elements for pharmaceutical applications, exploring minerals and hydrocarbon resources from the seabed, and developing marine energy are the recent applications of the oceans as a result of advanced scientific research (United Nations Educational, Scientific and Cultural Organization, 2025). Therefore, conducting MSR undoubtedly contributes to the progress of mankind by several ways including eliminating poverty, ensuring food security, protecting the marine environment, sustainable use of marine living resources, learning about global climate phenomena, introducing ocean-based renewable energy, and safe marine navigation (Huang and Yang, 2021). Sri Lanka is an island nation situated in a strategically important location in the Indian Ocean and its Exclusive Economic Zone is 24 times larger than its land territory which is nourished with a significant amount of resources.

In the above backdrop, a better way forward with regard to MSR in the Sri Lankan context is critical for Sri Lanka in her journey to become a developed country in 2048.

MSR REGIME IN LOSC AND FROM A MARITIME ZONAL PERSPECTIVE

6. **General Provisions.** As indicated above, provisions of Article 5 of the 1958 Convention on the Continental Shelf have been carried forward in the MSR regime of the LOSC which formulates a comprehensive framework to facilitate and regulate MSR. However, a significant portion of existing customary law has been made in the LOSC expanding the geographical extent, scope, and also the coastal state jurisdiction over MSR (Rothwell and Stephens, 2016). It is significant to note that the Convention, in its Preamble, recognizes the significance of promoting the study of the marine environment. Part XIII of the LOSC outlines the MSR regime negotiated as a 'package deal' at UNCLOS III which includes six sections namely, general provisions; international cooperation; conduct and promotion of marine scientific research; scientific research installations or equipment in the marine environment; responsibility and liability; and settlement of disputes (DOALOS, 2025).

7. Part XIII begins with Article 238 which outlines the right of all States (including non-members to the Convention), irrespective of their geographical location to conduct MSR in accordance with the other rules in the Convention. It is significant to note that such rights have been extended to competent international oceanographic organizations, for instance, the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO) (Rothwell and Stephens, 2016). Articles 240 and 241 supplement the general provisions of MSR which apply to all maritime zones. The four principles outlined in Article 240 require MSR shall (a) be conducted exclusively for peaceful purposes; (b) be conducted with appropriate scientific methods and means compatible with this Convention; (c) not unjustifiably interfere with other legitimate uses of the sea compatible with this Convention and; (d) be conducted in compliance with all relevant other provisions in the Convention.

8. According to Article 241, MSR activities do not provide any legal basis to claim any part of the marine environment or its resources. Articles 242 to 244 emphasize the obligation to promote international cooperation, especially the dissemination of scientific knowledge acquired from such MSRs to developing countries who lack sufficient capacity to conduct oceanographic research. Rothwell and Stephens, 2016 argues that such knowledge is significant not only for economic purposes but also for understanding climate change and its implications for the change of regional climate and weather patterns. Article 242 (2) obliges a State to provide

other States a reasonable opportunity to obtain from it, or with its cooperation, information necessary to prevent and control damage to the health and safety of persons and the marine environment in the application of part XIII of the Convention.

9. **MSR in Internal Waters and Territorial Sea.** The coastal State enjoys sovereignty over its internal water and territorial sea in accordance with Article 2 of LOSC. This sovereignty constitutes a coastal State to control MSR in the territorial waters as envisaged in Article 245 of LOSC. The express consent of the coastal State shall be required to conduct MSR by a foreign entity, and also subject to any conditions set by the coastal State. The same provisions apply in internal waters as well. Further, Article 40 outlines that foreign ships, including MSR and hydrographic survey ships, may not carry out any research or survey activities during a transit passage in straits used for international navigation without the prior authorization of the States bordering straits.

10. The same provisions apply mutatis mutandis to archipelagic sea lanes passage as well by virtue of Article 54 of the Convention. Further, Article 21 (1) (g) of LOSC authorizes a coastal State to regulate an innocent passage in respect of MSR. Passage through the territorial sea will become non-innocent if the foreign vessel is involved in any research or survey activities undertaken without the consent of the coastal State as outlined in Article 19 (2) (j) of LOSC. Thereby, the coastal State may take the necessary steps to prevent such passages which are not innocent in accordance with Article 25 (1), and Article 25 (2) of the Convention authorizes a coastal State to take necessary steps if a foreign vessel violates MSR laws and regulations of the coastal State.

11. **MSR in the EEZ and Continental Shelf.** Article 56 (1) (b) (ii) of the Convention outlines the exclusive jurisdiction of the coastal State related to MSR in its EEZ and it is essential to refer to this in light of Article 246 of the Convention. MSR regime in both EEZ and continental shelf is envisaged in Article 246 as a combined set of provisions without making a distinction between the two zones (Rothwell and Stephens, 2016). Article 246 (1) outlines the right of coastal States to regulate, authorize, and conduct MSR in both above zones consistent with other relevant provisions of LOSC. The consent regime of the coastal State as outlined in Article 246 (2) is the overriding rule in MSR where MSR in both these zones shall be conducted with the consent of the coastal State only. Further, Article 246 implies two distinctions in conducting MSR in the EEZ and on the continental shelf, i.e. 'pure' and 'applied' (DOALOS, 2025). According to Article 246 (3), **'pure'** MSR is conducted *'exclusively for peaceful purposes and in order to increase scientific knowledge of the marine environment for the benefit of all mankind'* whereas the

coastal States shall, in 'normal circumstances' grant their consent to conduct MSR in above-mentioned zones in accordance with the relevant provisions of the Convention.

12. Further, it obliges coastal States to establish rules and procedures ensuring that such consent will not be delayed or denied unreasonably. By contrast, Article 246 (5) implies the 'applied' nature of MSR projects which are of '**direct significance**' to the '**exploration and exploitation of natural resources whether living or non-living**'. The consent of the coastal State may be held in the above circumstances. **Other than that, Article 246 (5) provides another three conditions where a coastal State may withhold the consent to a researching State or a competent international organization if an MSR project involves drilling into the continental shelf, the use of explosives, or the introduction of harmful substances into the marine environment; involves the construction, operation or use of artificial islands, installations and structures referred to in articles 60 and 80; contains contrary and inaccurate information regarding the project communicated as listed in Article 248 or if the researching State or the organization has outstanding obligations to the Coastal State from a prior research project.**

13. **The water column in the extended continental shelf beyond 200 Nautical miles is considered as high seas and the Coastal State has sovereign rights over the seabed resources in this area** (Rothwell and Stephens, 2016). Notwithstanding the above, Article 246 (6) obliges coastal States not to withhold consent for MSR on the continental shelf beyond 200 nautical miles, except in designated areas of exploitation or detailed exploration carried out by the coastal State itself. The coastal State shall announce these areas and any changes. However, such details of the operations are not required to be given. Further, it should be noted that the provisions of Article 246 (6) must be interpreted and applied in a way that respects and upholds the established rights of Coastal States regarding their continental shelf. Moreover, coastal States cannot claim the right to supervise MSR beyond 200 nm just by submitting to the Commission on the Limits of the Continental Shelf under Article 76, despite the long process of finalizing recommendations and establishing shelf limits (Rothwell and Stephens, 2023).

14. Provisions in Article 247 are significant because it discusses the implied consent of a coastal State if it is part of or has a bilateral agreement with an international organization, and the organization wants to conduct MSR in that State's EEZ or continental shelf, the project is considered authorized if the State approved it or is willing to participate and has not objected within four months of being notified. In the same way, the consent of the coastal will be implied if it fails to notify its decision to grant or withhold the consent to the relevant researching State or the competent international organization six months after the date upon which they provided the

information required by Article 248, to the coastal State, unless the coastal State has informed the researching State or the organization within four months of the receipt of the request that it does not provide its consent. Or that the information given does not conform to the manifestly evident facts; or it requires supplementary information; or that outstanding obligations exist with respect to a previous MSR project carried out by the relevant researching entity.

15. It is worthy to mention the entitlement of the coastal State to require supplementary information relevant to conditions under Article 249 and the information provided under Article 248, within four months of the receipt of a request for consent. According to Article 248, not less than six months in advance of the starting date of the project in the EEZ or on the continental shelf, the researching State or the international organization must provide the coastal State with a full description of the nature and objectives of the project; the method and means to be used; the precise geographical areas in which the project is to be conducted; the time duration of the project; the name of the sponsoring institution/person in charge of the project; the extent to which the coastal State could participate in the MSR project.

16. The researching State and the competent international organization shall ensure the right of the coastal State to participate in the MSR project, when practicable, without any payment to the scientists of the coastal State, and without obligation to contribute to the costs. Such foreign researchers are obliged to provide the coastal State with preliminary and final reports; grant access to all data and samples; and provide the coastal State with an assessment of data, samples and research results or provide assistance in their assessment or interpretation at its request. Further, such research results are to be made available internationally through appropriate channels as soon as practicable. The researching entity is obliged to immediately inform the coastal State of any major change in the project. They are also under obligation to remove the scientific research installations or equipment once the research is completed unless the coastal State agrees otherwise. The specified conditions discussed above could be identified in the Convention which may be constituted by the coastal State for pure MSR in accordance with the intent of Part XIII to promote free scientific inquiry (Rothwell and Stephens, 2016).

17. In addition to the above, a significant feature of Article 249 is that it does not affect the right of the coastal State to establish conditions, under its laws and regulations, for granting or denying consent for an MSR pursuant to Article 246 (5) and, the requirement to obtain a prior agreement from the coastal State to internationally share research results of such projects important for natural resource exploration and exploitation, is significant. Although the LOSC does not allow coastal States to charge fees specifically for granting consent to conduct MSR in these zones,

an MSR project application assessment fee could be charged. Further, if the withholding of consent by the coastal State is inappropriate and inconsistent with the Convention, such a dispute is subject to conciliation as per the procedure laid down in Annex V to the Convention (DOALOS, 2025).

18. The coastal State shall have the right to suspend any MSR activities within these zones if the researching entity is not conducting such activities in accordance with the information provided under Article 248 or; if the relevant foreign entity fails to comply with the rights of the coastal State related to MSR projects as outlined in Article 249. Nonetheless, such a suspension shall be lifted and allow MSR activities to continue once the researching State or the organization meets the conditions in Articles 248 and 249.

19. Neighbouring landlocked and geographically disadvantaged States may also enjoy certain rights for information and participation with regard to MSR conducted in the EEZ or the continental shelf of the coastal State, as articulated in Article 254. Moreover, pursuant to Article 255 of the Convention, coastal States shall formulate reasonable rules and procedures to promote and support MSR activities beyond their territorial sea and in doing so they should also facilitate access to their harbours and assist research vessels that comply with the relevant provisions of Part XIII of the 1982 LOSC.

20. **MSR on the High Seas.** Article 86 of LOSC defines ‘High Seas’. The High Seas are open to all States. Article 87 (1) (f) of LOSC provides all States the freedom of the high seas to conduct scientific research subject to Parts VI and XIII of LOSC. Researching entities shall give due regard for the interests of other States in their exercise of the freedoms of the high seas, and also with due regard for the rights related to activities in the Area when exercising the above-mentioned freedom. Further, Article 257 of LOSC also affirms the right of all States, whether coastal or land-locked, and competent international organizations to conduct MSR on the high seas in conformity with the Convention.

21. **MSR in the International Deep-seabed (Area).** Article 1 (1) (1) defines the ‘Area’. The Area and its resources are the common heritage of mankind. Article 256 of the Convention envisioned the right of all States, irrespective of their geographical location, and competent international organizations to conduct MSR in the Area in conformity with the provisions of Part XI of LOSC. According to Article 143 (1) of LOSC, MSR in the Area shall be carried out exclusively for peaceful purposes and for the benefit of mankind as a whole. The International Seabed Authority (ISA) may carry out MSR concerning the Area and its resources.

Further, the ISA shall promote and encourage the conduct of MSR in the Area and coordinate and disseminate such research and analysis results when available. In the same way as the ISA, all States conducting MSR in the Area are also obliged to promote international cooperation in marine scientific research in the Area by engaging in international programmes and encouraging cooperation in MSR among different countries and the ISA; developing programmes through the Authority for the benefit of developing States; training personnel in research techniques; fostering employment in research, and disseminating research results through international channels.

22. **MSR Installations and Equipment.** Such installations or equipment do not possess the status of islands. A safety zones of a reasonable breadth not exceeding a distance of 500 metres may be designated around MSR installations and vessels of all States shall respect such safety zones. Installations or equipment must not obstruct shipping routes. They must have identification marks showing their registry State or organization, and must display internationally agreed warning signals for sea and air safety, following standards set by competent international organizations (for instance International Maritime Organization).

23. **Responsibility and Liability.** Article 263 (1) obliges States and competent international organizations to be responsible for ensuring that MSR is conducted consistent with the Convention. Further, such researching entities are responsible and liable for any actions that contravene this Convention concerning MSR by other States, their natural or juridical persons, or by competent international organizations, and must compensate for any resulting damage caused by such actions. Moreover, Article 263 (3) envisioned that researching entities shall be responsible and liable for any marine pollution damage caused by their MSR activities or research conducted on their behalf, pursuant to Article 235 of LOSC.

24. **Disputes Resolution.** Disputes arising on the interpretation or application of this Convention's provisions on MSR shall be resolved according to Part XV, sections 2 and 3 of LOSC. Until a dispute is resolved according to the above procedure, the State or organization conducting the MSR project shall obtain explicit consent from the relevant coastal State before starting or continuing the research.

GAPS AND LIMITATIONS IN LOSC RELATED TO MSR

25. The non-availability of a proper definition of MSR in the Convention is a critical lacuna. This lacuna has been significantly apparent in recent years in the face of the predominant development of science and technology. Further, it has led to the difficulty of distinguishing 'operational oceanography' and 'MSR' to determine which types of research activities fall into which of the above categories.

Although operational oceanography is not defined in the Convention, the routine collection of ocean data such as temperature, pressure, current, salinity, and wind used for meteorology, climate prediction, and predicting the sea state could be identified as operational oceanography (Beckman and Davenport, 2012). However, it was concurred that the collection of marine meteorological data was not MSR regulated by Part XIII of the Convention by the Chairman of the Third Committee at UNCLOS III (Beckman and Davenport, 2012). Nonetheless, deploying certain data collection instruments at sea such as Argo robotic floats has been controversial (Beckman and Davenport, 2012). Nearly 3000 active free-floating devices deployed at sea under the Argo Project gather ocean signals related to climate change which is significant for protecting life and property. Many States such as the USA recognize this project as operational oceanography and not MSR and therefore, no consent of the coastal State is required. Nonetheless, some other States such as Peru and Argentina argue that coastal State consent is required for operational oceanography same as for MSR (Beckman and Davenport, 2012).

26. Moreover, it is worthy to examine the States' practices when applying the MSR regime. There are several instances reported where some States violate some other treaty obligations under the disguise of MSR. For instance, the International Court of Justice (ICJ) case in 2010 involving Australia's challenge to Japan's whaling programme which violated the 1946 International Convention for the Regulation of Whaling, highlighted the issue of defining 'scientific research' (Teimurov and Kozheurov, 2020). Though the Court did not conclude a definition for MSR, relying on expert opinions, highlighted essential characteristics for genuine scientific research, such as clear objectives, use of appropriate methods, and avoidance of adverse effects on resources. Ultimately, the ICJ ruled that Japan's whaling programme was inconsistent with these criteria and was not for scientific purposes (Teimurov and Kozheurov, 2020).

27. The unclear concept of 'pure' and 'applied' MSR were heavily debated at UNCLOS III. Several States argued that full freedom to conduct pure MSR in the EEZ and continental shelf should be available whereas the coastal State's consent should be obtained for applied MSR only (Teimurov and Kozheurov, 2020). Although the 'direct significance' context stipulated in Article 246 (5) (a) might have been suited during UNCLOS III negotiations related to natural resources, the current suitability of this provision is not as clear in the context of advanced biotechnology (Rothwell and Stephens, 2023). Bioprospecting in the oceans is such a technology which involves discovering organisms through 'pure' MSR that are later developed into commercial applications. However, when bioprospecting involves the sample collection process which does not differ from pure MSR, it could be argued that coastal States should normally grant their consent (Rothwell and Stephens, 2023). In the above perspective,

the LOSC lacks clear guidelines for regulating bioprospecting and whether it should be treated as 'applied' MSR, leading to ambiguity in how coastal States should handle consent for such activities.

28. Kanehara, 2021 indicates the lack of comprehensive delimitation agreements between China, Japan, and Korea in the East China Sea highlights a significant limitation of the LOSC regarding MSR conducted in disputed sea areas. The convention does not adequately address how MSR should be conducted in such undelimited maritime areas.

29. Ysem, 1995 argues that Article 255 allows a foreign research vessel to exercise rights of port access even though it has not been cleared by the relevant coastal State. However, it could be observed that Sri Lanka issued a one-year moratorium prohibiting Chinese research vessels from accessing Sri Lankan ports as diplomatically pressured by India, and accordingly, the Chinese ship Xiang Yang Hong 3 was prohibited from docking in Sri Lanka in January 2024 (Foreign Military Studies Office, 2024). Moreover, States shall avoid exerting any threats or use of force against other States respecting the principles of international law as endorsed in the UN Charter as endorsed in Article 301 of LOSC, and therefore this incident could be taken as a violation of this Article by India by using soft power measures against Sri Lanka.

30. Ysem, 1995 argues that the oceanographic knowledge should be considered as an intellectual property. However, the LOSC is silent with regard to the intellectual property rights of MSR which is a significant lacuna in the Convention.

31. Some maritime powers such as the United States of America (USA) and the United Kingdom (UK) argue that the coastal State's consent for hydrography and military surveys in the EEZ and continental shelf is not required quoting those are also the other lawful uses of the sea related to high seas freedoms, like operating ships as allowed for other States in the EEZ as stipulated in Article 58 (1) of LOSC (Rothwell and Stephens, 2016). On the contrary, States such as China have incorporated the requirement of obtaining their consent for such surveys conducted in the EEZ and continental shelf, in their legislation. For instance, China and India have filed multiple complaints over survey activities conducted by USA and UK vessels in their EEZs (Rothwell and Stephens, 2016). Therefore, Maritime security escalations caused by such controversies are crucial.

WAY FORWARD FROM SRI LANKA'S PERSPECTIVES

32. Based on the aforementioned facts, following recommendations are derived in order to tailor 'Way Forward for Sri Lanka in MSR' that suits to Sri Lanka's geopolitical context, developmental needs, and legal obligations under LOSC and related instruments.

- a. **Adopt a balanced and transparent legislation for MSR.** Sri Lanka should update its MSR legislation to ensure a balanced, transparent framework that protects its sovereign rights while respecting international freedoms of navigation and research. The country should also address gaps in intellectual property rights for research results through alignment with international laws and bilateral agreements under Part XIII of the LOSC.
- b. **Regional MSR Governance Frameworks.** Sri Lanka should promote a regional agreement to resolve MSR disputes in the region while focusing better address of local nuances.
- c. **Enhancing the relationship with the IOC.** The role of the IOC is critical in resolving the ongoing controversies on MSR aspects. Therefore, Sri Lankan authorities should focus more on enhancing the relationship with the IOC. The role of the United Nations division and Ocean Affairs and Climate Change division in the Foreign Ministry is significant.
- d. **Integrate Provisions from other International Instruments.** Given the gaps in LOSC related to the MSR regime, Sri Lanka should integrate relevant provisions from other international instruments such as the 1992 Convention on Biological Diversity (CBD), the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, its 1996 London Protocol, and the 1995 United Nations Fish Stocks Agreement. Specifically, promoting uniformity and consistent consent regimes, enhancing environmental protections, and ensuring biodiversity considerations in MSR activities should be integrated by Sri Lanka accordingly.
- e. **Establish Scientific Review and Oversight Mechanisms.** Additionally, Sri Lanka should promote establishing an international peer-review system for proposed research projects and their results as determined by the ICJ in the case of Australia vs Japan as discussed above (Teimurov and Kozheurov, 2020), along with regular audits. This approach would help to harmonize practices globally and minimize disputes over genuine scientific research. Working closely with the IOC which is a competent international organisation, is critical with that regard.

f. **Enhance Participation and Capacity-Building Opportunities.** Sri Lanka should promote joint MSR initiatives with friendly and regional States. Encouraging researcher exchanges and opportunities for the scientists of under-developed and developing countries would build trust, and enhance Sri Lanka's MSR capabilities. Further, that will enhance maritime scientific diplomacy as well.

g. **Promoting Good Faith and Peaceful Conduct.** Sri Lanka should voice out in the UNO and other relevant international forums urging all states to respect the provisions envisaged in Article 300 and Article 301, emphasising the significance of States Parties acting in good faith and not abusing their rights, jurisdiction, and freedom under this Convention. Sri Lanka should urge the international community to avoid any threats (even in the form of soft power measures) or use of force against other States respecting the principles of international law as endorsed in the UN Charter.

CONCLUSION

33. Curiosity about exploring the seas is as old as humanity. Research on the oceans significantly contributed to human civilization. Oceanographic research is critical for discovering the predominant wealth in the oceans and the sustainable use of its resources. Modern oceanographic research, which began with the HMS Challenger, has rapidly advanced along with technological progress over the years. Challenger exercised uninterrupted freedom of seas during her passages. Nonetheless, the need for a solid framework for conducting MSR activities was deemed necessary, and such an attempt was first observed in UNCLOS I in 1958.

34. Subsequently, the MSR regime was more comprehensively endorsed in the LOSC by codifying customary law and provisions of the 1958 Convention on the Continental Shelf despite many debates on it. Although the Convention outlines the duties and responsibilities of States in each maritime zone, critical gaps have created ambiguities and, at times, maritime security escalations. Sri Lanka being a significant stakeholder in the Indian Ocean region faces numerous challenges with regard to conducting MSR in her waters and therefore, requires a proactive and balanced approach safeguarding its sovereign rights and environmental interests. In the above context, the proposed way forward from Sri Lanka's perspectives would be significant in effectively addressing these challenges which would strengthen the MSR regime and ensure sustainable, secure, and peaceful use of the waters under the jurisdiction of Sri Lanka.

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THE OVERLAP OF CROSS - BORDER ILLEGAL FISHING AND DRUG/CONTRABAND TRAFFICKING IN PALK BAY

**Commander WPPN Perera psc, MBM (UoC), MCPS (UoC), MSc (D&SS-KDU),
MSP(GRIPS, JPN) BSc (Hons) MTS (DS), MIM (SL), JP (All Island)**

ABSTRACT

Cross-border illegal fishing (CBIF) has long been identified as a threat to marine biodiversity and coastal economies. However, its potential role in enabling maritime transnational organised crime, particularly in the Indian Ocean Region (IOR), remains under researched. This article presents a case study of CBIF in Palk Bay, Sri Lanka based on an indepth qualitative analysis of 208 preliminary investigation reports and semi structured interviews. While only a small proportion of fishing vessels involved in CBIF were found to directly participate in drug and contraband trafficking, a significant number of trafficking incidents were conducted under the indirect cover of illegal fishing fleets. This indicates that CBIF plays a substantial enabling role in regional maritime criminal networks. The study calls for a comprehensive maritime security strategy that views CBIF not only as a resource exploitation issue but also as a national and regional security concern.

Keywords: Cross-border illegal fishing (CBIF), Drug/Contraband trafficking, transnational organised crime (TOC), Palk Bay

INTRODUCTION

Cross-Border Illegal Fishing (CBIF) is widely acknowledged as a major threat to the ecological, economic and social stability of coastal states. This leads to overfishing, threatens food security, jeopardises livelihoods, and diminishes national economies (Chapsos et al., 2019; Lestari et al., 2019; Pauly et al., 2002; Salagrama, 2015). Global estimates suggest that CBIF leads to economic losses between USD 10 billion and 23.5 billion each year (Agnew et al., 2009). The majority of current studies on CBIF have concentrated on its effects on resource depletion, food insecurity, and the long-term sustainability of fisheries (Chapsos et al., 2019; Dodangodage, 2021; Salagrama, 2015; Scholtens, 2016).

However, emerging literature has begun to explore the connection between CBIF and transnational organised crime (TOC), highlighting the use of fishing vessels for illicit activities including drug trafficking, arms smuggling and coerced labour (Belhabib and Le Billon, 2020; Bondaroff et al., 2015; Witbooi et al., 2020; UNODC, 2011). Empirical research in the Pacific Ocean has demonstrated that illegal fishing underpins criminal networks and is associated with drug trafficking, piracy and modern slavery (Chapsos and Hamilton, 2018; Crowell and Turvold, 2020; Poling and Cronin, 2017). Notwithstanding these advancements, there exists a significant deficiency of empirical evidence about the relationship between CBIF and TOC in the Indian Ocean Region (IOR).

Palk Bay, situated between Sri Lanka and India, is one such region where drug and contraband trafficking have been increasingly reported (INCB, 2016; UNODC, 2005; Sri Lanka Navy, 2022). Sri Lanka has been identified as a significant transit point for narcotics, particularly through the Palk Bay corridor (INCB, 2016; UNODC, 2005) with Indian fishing vessels implicated in concealing smuggling operations under the guise of CBIF (INCB, 2016). Ongoing illegal fishing by Indian trawlers has posed persistent challenges to Sri Lanka's socio-economic and national security landscape (Adams, 2015; Sossai, 2017; Vivekanandan, 2001), as evidenced by numerous cross-border incursions recorded in naval reports (Sri Lanka Navy, 2022).

Figure 1- Map illustrating the Palk Bay



Note. *Transboundary Dialogue and the "Politics of Scale" in Palk Bay*, Stephen et al. (2013)

International organizations like INCB and UNODC have recognized a potential trafficking nexus involving CBIF, but the specifics of this relationship are not well understood. This study aims to address the lack of empirical analysis in the Indian Ocean Region, especially in Palk Bay, by investigating how CBIF contributes to drug and contraband trafficking in this important maritime area. The goal is to provide

insights that will help policymakers better understand CBIF and its implications for national security, ultimately leading to the creation of more robust national security policies and enabling law enforcement agencies to conduct effective operations through realistic regional collaboration.

Methodology

The study used a qualitative case study approach to investigate the link between CBIF and marine drug/contraband trafficking in the Palk Bay region. Secondary data was gathered from various sources, including published reports from the Ministry of Fisheries and Aquatic Resources, Sri Lanka Navy, and Coast Guard. Primary data was collected through ten semi structured interviews with individuals involved in maritime law enforcement and research. The analysis was conducted in two stages: examining drug and contraband trafficking patterns from 2013 to 2021 and analysing the overlap between CBIF and trafficking activities through 208 preliminary investigation reports (85 drug-related and 123 contraband-related). Interview responses were used to triangulate and contextualize the findings.

Findings and Discussion

Overlap Between CBIF and Drug/Contraband Trafficking: The Case of Palk Bay Sri Lanka

This section examines the intersection between CBIF and transnational maritime crimes, particularly drug and contraband trafficking, based on 85 drug trafficking cases (2013–2021) and 123 contraband seizures (2019–2021) in the Palk Bay area, as recorded by the Sri Lanka Navy. Using preliminary investigation reports and semi structured interviews, this analysis explores the conditions under which CBIF may facilitate or overlap with these criminal activities.

Nexus Between CBIF and Drug/Contraband Trafficking

This study aims to assess the extent and conditions under which CBIF actors may directly or indirectly engage in drug and contraband trafficking. Drawing on literature and field insights, five interlinked conditions are identified as facilitating this nexus:

- a) Use of illegal trawlers as cover.
- b) Trafficking as a lucrative alternative income.
- c) Exploitation of fishers in criminal networks.

- d) Local fishers' knowledge of maritime terrain and enforcement patterns.
- e) Connections between vessel owners and traffickers.

A key argument is that one or more of these conditions often co-exist in trafficking incidents in Palk Bay. While Sri Lankan authorities have recorded numerous trafficking cases, distinguishing whether these vessels were also involved in CBIF remains difficult. This is largely due to operational classifications, where vessels are recorded solely under the offense for which they were apprehended either drug or contraband trafficking without considering their involvement in CBIF. Consequently, this research relies on qualitative data from preliminary investigation reports and interviews with Navy officers, fisheries officials and the Police Narcotics Bureau to explore overlaps not captured in official statistics.

Arrest of Indian and Sri Lankan Drug/Contraband Trafficking Vessels

Table 1- *Categorization Arrested Drug/Contraband Trafficking Vessels according to State*

Year	Arrested Vessels for Drug Trafficking owned by SL	Arrested Vessel for Drug Trafficking owned by India	Arrested Vessel for Contraband Trafficking owned by SL	Arrested Vessel for Contraband Trafficking owned by India
2013	-	01	-	-
2014	-	03	-	-
2015	01	02	-	-
2016	07	03	-	-
2017	03	01	-	-
2018	05	02	09	-
2019	14	-	18	03
2020	16	-	19	06
2021	26	01	46	12
S/Total	72	13	92	21
Total	Drug Trafficking-85		Contraband Trafficking-123	

Table 1 indicates a total of 208 seized fishing vessels associated with drug trafficking (2013-2021) and contraband trafficking (2019-2021). The table categorises the seizures into two groups based on the nationality of the vessels: Indian or Sri Lankan. Seventy two Sri Lankan vessels were confiscated for drug trafficking, while ninety-two were seized for contraband trafficking. Only 13 and 21 Indian vessels were confiscated for narcotics and contraband trafficking.

Intersection between Confiscated Sri Lankan Drug Trafficking Vessels and CBIF

Table 2 - Classification of Confiscated Sri Lankan Drug Trafficking Vessels

Year	Type of Arrested Vessels	Type and quantity of drug apprehended (Kg)		Value of Drugs (Rs)	Connection with Indian Vessels,
2015	1 FGD (Fiber Glass Dinghy)	Heroin	0.00063	No	Indian fishing Dhows
		Kerala Cannabis	594.272		
2016	7 FGD	Heroin	113.3278	No	Indian fishing Dhows (03 CBIF)
		Kerala Cannabis	1000.092		
2017	3 FGD	Heroin	29.95356	No	Indian fishing Dhows (01 CBIF)
		Kerala Cannabis	1005.428		
2018	5 FGD	Heroin	1.0655	No	Indian fishing Dhows (01 CBIF)
		Kerala Cannabis	1122.512		
2019	12 FGD, 1 Trawler, 1 Vallam	Kerala Cannabis	1244.600	311,150,000.00	Indian fishing Dhows
2020	15 FGD, 1 Vallam	Kerala Cannabis	2015.780	503,945,000.00	14 Indian fishing Dhow and 02 Vallam

Note. Preliminary Investigation Reports by the Sri Lanka Navy on Drug and Contraband Trafficking Cases

Table 2 indicates that between 2015 and 2021, Sri Lankan fiberglass fishing dinghies, two one-day trawlers and one non-mechanized traditional boat (Vallam)—were predominantly confiscated for involvement in heroin, Kerala cannabis and methamphetamine trafficking. The transportation of heroin commenced in modest amounts in 2015 and since 2018, there have been no confiscations of heroin. Conversely, cannabis smuggling in Kerala has markedly escalated throughout the years: from a little over 594 kg in 2015 to over 3352 kg by 2021. In four instances of Sri Lankan vessel seizures, the investigation revealed no association with Indian fishing vessels.

In other instances, the confiscated Sri Lankan vessels were linked to Indian fishing dhows, since cross-border Indian fishing vessels were involved in the transfer of drugs carried onto Sri Lankan boats. Nonetheless, among the aforementioned seizure cases, only 8 Indian vessels were documented as participating in CBIF at the time of seizure. The predominant category of Indian fishing vessels involved in drug trafficking was Indian fishing dhows, with no narcotics discovered on Indian fishing trawlers. The findings suggest that cross-border Indian fishing trawlers predominantly participate in CBIF. Furthermore, Interview Respondents 8 and 9 (2022) indicated that Indian drug trafficking vessels—transporting substantial quantities of Kerala cannabis—may participate in CBIF at the completion of trafficking transactions. Nevertheless, the publications lack any data for study.

Intersection between Confiscated Indian Drug Trafficking Vessels and CBIF

Table 3 - Categorisation of Confiscated Indian Drug Trafficking Vessel

Year	Type of Arrested Vessels (Mechanized trawlers/ Fishing dhow/ any other)	Type and quantity of drug apprehended (Kg)	Value of Drugs (Rs)	Engaging Fishing / Only drug transporting	
2013	01 fishing dhow	Hans	225	-	Engaging Fishing
2014	03 fishing dhow	Hans	1.35	-	Engaging Fishing
2015	02 fishing dhow	Kerala Cannabis	300	-	Drug transport
2016	02 fishing dhow, 01 Vallam	Hans	26.5	-	Engaging Fishing
		Opium	15.398	-	Engaging Fishing
2017	01 dhow	Kerala Cannabis	669	-	
2018	02 dhow	Kerala Cannabis	690	-	No
2019	-	-	-	-	
2020	-	-	-	-	
2021	01 fishing dhow	Kerala Cannabis	124.65	31,162,500.00	Engaging Fishing

Note. *Preliminary Investigation Reports by the Sri Lanka Navy on Drug and Contraband Trafficking Cases*

Table 3 illustrates that from 2013, with the exception of 2019 and 2020, fewer than 3 Indian fishing boats were seized annually for drug trafficking activities, which included hash, opium and Kerala cannabis, with Kerala cannabis being the most commonly seized substance. The majority of the cases involved Indian fishing dhows participating in drug trafficking, with a few exceptions being vallams. The interviews indicated that fishing vessels involved in trafficking high value drugs or small quantities of drugs were engaged in CBIF at the time of seizure (Interview Respondent 4, 5, 8, and 9, 2022). Furthermore, among the aforementioned seizures, eight Indian drug trafficking vessels were involved in CBIF at the time of the seizure.

Analysis of the Intersection between Confiscated Sri Lankan Contraband Trafficking Vessels and the CBIF

Table 4 - Classification of Confiscated Contraband Trafficking Vessels of Sri Lanka

Year	Type of arrested vessel (FGD/Vallam/ any other)	Type and quantity of Contraband arrested (Kg)		Affiliation with Indian vessels
2019	17 FGD, 01 Trawler	Kendu leaves	17192.900	Indian fishing Dhow
2020	FGD	Kendu leaves	1060.200	Indian Fishing Dhow
	16 FGD, 03 Vallam	Turmeric	10597.220	Indian Fishing Dhow
2021	01 FGD	Kendu leaves	990.500	Indian fishing Dhow
	39 FGD, 03 Vallam	Turmeric	22549.450	Indian fishing Dhow
	01 FGD	Cardomon	11.700	Indian fishing Dhow
	01 FGD	Onion seeds	10.685	Indian fishing Dhow

Source: *Preliminary Investigation Reports by the Sri Lanka Navy on Drug and Contraband Trafficking Cases*

Table 4 illustrates the seizure of 92 Sri Lankan fishing vessels for contraband trafficking between 2019 and 2021, involving items such as kendu leaves, turmeric, cardamom, and onion seeds. Of the 92 seizures, 85 included fibreglass dinghies, six pertained to mechanised boats (Vallam), and one was a fishing trawler. In all aforementioned instances, Sri Lankan fishing vessels were linked to Indian fishing dhows, since suspected contraband was conveyed to these vessels by Indian fishing dhows at various sites in Palk Bay. Nonetheless, there was no evidence to substantiate that Indian fishing dhows were participating in CBIF throughout the transfer period.

Intersection between Confiscated Indian Contraband Trafficking Vessels and CBIF

Table 5 - Classification of Confiscated Indian Contraband Trafficking Vessels

Year	Type of arrested vessel	Type and quantity of Contraband arrested (Kg)		Engaged in Illegal Fishing /Contraband transporting only
2019	03 Dhow	Kendu leaves,	4806.800	contraband transporting only
2020	06 Dhow	Turmeric	14844.200	contraband transporting only
2021	01 Dhow	Kendu leaves,	1101.000	contraband transporting only
	09 Dhow	Turmeric	26865.400	contraband transporting only
	02 Dhow	Onion Seeds Green Cardamon	294.500 1232.000	contraband transporting only

Note. Sri Lanka Navy Preliminary Investigation Reports for Drug and Contraband Trafficking Cases

Table 5 shows that from 2019 to 2021, there were 21 cases in which Indian fishing dhows were seized for contraband trafficking, mainly with Kendu leaves, turmeric, and green cardamom. In all of the above cases, boats were seized in Sri Lankan territorial waters. They were engaged only in contraband trafficking and were not engaged in CBIF at the time of the seizure.

Magnitude of Sri Lankan and Indian Fishing Vessels Engaged in Drug and Contraband Trafficking

A study of 208 drug and contraband trafficking cases in Sri Lanka and India found that various fishing vessels were used. Indian vessels were primarily mechanized dhows and vallams, while Sri Lankan vessels were mostly fiberglass dinghies. There has been an increase in Sri Lankan vessels involved in drug trafficking, while seizures of Indian vessels for similar offenses have declined. Reduced interdictions of Indian vessels may result from transactions occurring near the International Maritime Boundary Line (IMBL), typically at night within CBIF trawler clusters. Some Sri Lankan trafficking boats ventured deep into Indian waters to complete transactions, complicating enforcement. Contraband trafficking vessel seizures have increased on both sides due to longer transaction times and larger cargo volumes. Although only a small number of Indian boats were seized in Sri Lankan waters, many Sri Lankan vessels had operational ties with Indian counterparts. Based on these linkages, the study conservatively estimates that 208 Indian boats were involved in trafficking activities, which is negligible compared to the total Indian fishing fleet in Palk Bay (194,490 vessels by Infantina and Jayaram, 2020). However, when measured against the approximately 3,000 Indian boats involved in CBIF, the 208 implicated vessels represent about 6.9%, which is concerning given the likelihood of many trafficking activities remaining undetected.

Overlap between Boats Trafficking Drugs/Contraband and CBIF

Preliminary investigation reports reveal limited evidence of Indian fishing vessels engaging in drug/contraband trafficking and cross-border illegal fishing simultaneously. Out of 208 cases, only 16.69% showed a direct overlap. However, this figure may underrepresent the true extent of the issue, as undetected cases are suspected. No officially recorded cases involved Indian CBIF trawlers participating in trafficking, and three incidents were absent from investigation reports and excluded from the dataset.

The type of vessel plays a significant role in the likelihood of overlap between contraband trafficking and illegal fishing. Indian dhows used for contraband trafficking typically do not engage in illegal fishing, and most seized dhows lack fishing gear, reinforcing their primary use for smuggling. Large volumes of drugs also carry no fishing equipment. (Interview Respondents 1, 4, 5, 6, and 9, 2022).

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Conditions that Involvement of Cross-border Illegal Fishers in Drug/Contraband Trafficking

The preliminary investigation reports and interviews (Respondents 8 and 9, 2022) reveal that Indian and Sri Lankan fishing vessels and personnel are involved in drug and contraband trafficking across the Palk Bay, with Indian dealers coordinating with Sri Lankan sub dealers who rely on local fishers for maritime transportation. Respondent 1 (2022) states that smuggling activities are carried out by Sri Lankans who have illegally migrated to India, with the support of their Sri Lankan relatives.

The research identified key conditions influencing fishers' involvement in drug and contraband trafficking. The two most prominent were:

1. Indian CBIF fishers' detailed knowledge of maritime geography and law enforcement patterns.
2. The appeal of higher, quick earnings compared to legal fishing.

Dealers relied on fishers' expertise in navigation, sea conditions and vessel movements for drug trafficking. Drug carriers had no direct contact with main traffickers, reducing legal risk for fishers. Many fishers reported being released after a short period and negotiating compensation exceeding regular income. However, only a small number of fishers accepted the risk, reflecting the higher prevalence of CBIF over trafficking.

The third significant condition identified was the use of CBIF trawlers as operational cover. Interviewees (Respondents 1, 3, 4, 5, 6, 7, 8, and 9, 2022) noted that low-profile Indian dhows, barely visible beyond two nautical miles, often operated undetected among large CBIF trawler clusters in Sri Lankan waters. These dhows transferred contraband to Sri Lankan fiberglass dinghies, despite limited nighttime surveillance, inadequate radar capability and the overwhelming number of vessels at sea, indirectly providing critical concealment for trafficking operations. The least significant contributing factor was the relationship between traffickers and boat owners. While phone records and interrogation reports suggest some linkages (Respondent 2, 2022), there is insufficient evidence to establish that these relationships were a primary driver for fisher's involvement in trafficking. Another condition considered was coercion or exploitation of fishers, and it was not substantiated in the Palk Bay context. According to Respondent 9 (2022), there is no direct evidence of fisher exploitation in the region, although such cases have been anecdotally reported in southern Sri Lanka.

Fishery involvement in India and Sri Lanka can be influenced by two indirect economic conditions. Restrictive fishing limits in India have increased competition and reduced income opportunities, potentially pushing some fishers towards trafficking. In Sri Lanka, repeated damage to local fishing gear and competition from Indian trawlers have displaced many fishers. Some Sri Lankan fishers avoid fishing during Indian CBIF operations due to disparities in technology and capacity, potentially incentivizing illicit activities.

Conclusion

This research investigated the nexus between CBIF and maritime crime, especially drug and contraband trafficking in the Palk Bay area. Using a qualitative methodology, including the analysis of 208 preliminary investigation reports and ten semi structured interviews, the study identified both direct and indirect relationships between CBIF and transnational organised crime (TOC). While only 7.69% of cases demonstrated direct overlap, the findings revealed that CBIF fleets often provide significant operational cover for trafficking activities, suggesting that the actual extent of convergence may be underreported. One of the most striking conclusions is the indirect but systematic role CBIF plays in enabling maritime crime. Although Indian CBIF trawlers were not directly involved in transporting drugs or contraband, their presence created dense maritime traffic that traffickers used strategically to avoid detection. Smaller dhows, often without fishing gear, were used for large volume trafficking operations, remaining concealed among trawler clusters. These conditions were further enabled by the limited night time surveillance capabilities and insufficient patrol assets of Sri Lanka's maritime law enforcement agencies.

The study reveals that Indian and Sri Lankan fishermen are key transporters in maritime trafficking, often unaware of the masterminds' identities. This structural disconnection protects drug and contraband dealers, while the higher income and minimal legal repercussions for first-time offenders incentivize participation among a small but significant number of fishermen. The study reveals three key factors contributing to fisher involvement in criminal activities: operational knowledge of sea routes, economic motivation due to declining fisheries and restrictive regulations, and strategic use of CBIF trawler clusters for concealment. Contextual factors like India's restrictions on fishing days and damage to Sri Lankan fishing gear may further encourage illegal activities.

The study highlights the need to reclassify cross border illegal fishing as a national and regional security threat, as unregulated activities have created a conducive environment for organized criminal networks. To tackle this, an integrated approach is needed, including enhanced bilateral cooperation between India and Sri Lanka, technological upgrades in maritime domain awareness, and socioeconomic interventions to reduce the vulnerability of coastal fishing communities through

alternative livelihoods and community engagement. If left unaddressed, the convergence of CBIF and TOC in Palk Bay could escalate, not only threatening Sri Lanka's national security but also destabilising the wider Indian Ocean Region. Robust, coordinated responses are therefore imperative to disrupt these illicit networks and secure maritime governance in this strategically vital area.

Recommendations

Based on the study, the following recommendations are suggested:

1. Reclassify CBIF as a maritime security threat with national and regional implications.
2. Enhance surveillance with drones, satellite tracking and night vision capable assets.
3. Strengthen India-Sri Lanka bilateral enforcement, including hotlines, shared intelligence platforms, and joint maritime operations.
4. Amend legal frameworks to enable targeting of trafficking masterminds rather than low level intermediaries.
5. Invest in coastal community development to reduce economic motivations for engaging in crime.

Future Research Focus

Future research should examine whether the link between CBIF and maritime trafficking seen in Palk Bay also exists in other parts of the Indian Ocean, such as the Bay of Bengal and Arabian Sea. This can be explored through quantitative modelling using satellite tracking, vessel monitoring, and interdiction records to estimate hidden trafficking activities. Socioeconomic profiling of apprehended or suspected fishers would shed light on the drivers of their involvement in maritime crime, while ethnographic studies and community discussions could reveal cultural and structural vulnerabilities. Finally, assessing current bilateral enforcement and legal frameworks would help identify institutional gaps and guide stronger regional cooperation against maritime crime.

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NOTES ON CONTRIBUTORS



Major BMHM Samarasinghe CR joined the Sri Lanka Army under Intake 27 of General Sir John Kotelawala Defence University on 20 September 2009, where he earned a Bachelor of Commerce (Second Class Upper). Upon commissioning, he served as a Team Commander, Officer Commanding in the unit level and Officer Instructor at the Sri Lanka Military Academy. He secured First in Order of Merit in Junior Staff Course 16, Second in Order of Merit in Junior Command Course 21 and he graduated from Defence Services Command and Staff College, Sri Lanka, securing Second in Order of Merit in Army Wing, concurrently completing Master's Degree in Defence and Strategic Studies from Kotelawala Defence University. At present, he serves as a Directing Staff at the Army War College.



Major G D R Nimesh is one of the officers of the Sri Lanka Armoured Corps who has vast command and staff experience. He has worked in different armoured regiments as a Troop Leader, Staff Officer III (Admin), Staff Officer III (Welfare) and Squadron Commander. He successfully attended a few professional military courses, such as the Defence Services Command and Staff Course, and has also received overseas training in Bangladesh and Pakistan. He has a Diploma in Military Studies (2013) obtained at the Sri Lanka Military Academy, University of Sbaragamuwa, and a Master's Degree in Defence and Strategic Studies (2025) obtained at the General Sir John Kotelawala Defence University. He is presently the Staff Officer II (Admin) at Regimental Centre, Sri Lanka Armoured Corps.



Major HMRS Herath SLE is a Commissioned Officer in the Sri Lanka Army and a graduate of the Defence Services Command and Staff College. He holds a Bachelor of Science in Civil Engineering and a Master of Science in Defence and Strategic Studies from General Sir John Kotelawala Defence University. He has served in various command, staff and instructional roles within the Army. He is currently performing his duties as the Squadron Commander at General Sir John Kotelawala Defence University Southern Campus. With a keen interest in military leadership, defence studies and youth engagement, he combines academic insight with practical experience.



Lieutenant Commander KMGDK Dias is a qualified Marine Engineer in the Sri Lanka Navy. He completed a Bachelor of Science in Marine Engineering degree from KDU in 2010 and is an Associate member of both the Institute of Engineers, Sri Lanka and the Engineering Council of Sri Lanka. He graduated from Defence Services Command and Staff College, Sri Lanka and concurrently completed a Master's Degree in Defence and Strategic Studies at KDU. At present, he serves as the Senior Marine Engineer (OBM, Auxiliary Machinery and New Design) in the Eastern Naval Command of the Sri Lanka Navy.



Squadron Leader MDCES Jayarathna is a Senior Database Administrator of the Sri Lanka Air Force, with expertise in Software Engineering and Database Administration. He holds a Bachelor's degree from the National University of Ireland, Master's Degree in Information Technology from University of Colombo, Master's Degree in Defence and Strategic Studies from Sir John Kotelawala Defence University and graduated from Defence Services Command and Staff College, Sri Lanka in 2024. His research focuses on the impact of AI and AR technologies integrated flight simulator on the basic military pilot training of Cessna aircraft in SLAF. He is currently following Air Force Command and Information System Technology and Management course in Information and Navigation College, Air Force Engineering University, Xi'an in China.



Brigadier Janak Prematilake is a distinguished infantry officer with an exemplary record of service in both operational and academic spheres. He holds a Master of Science in Defence and Strategic Studies from the University of Kelaniya and a Master of Science in Defence and Strategy from the University of Madras, India. He also possesses a Bachelor of Arts in Defence Studies from General Sir John Kotelawala Defence University (KDU) and a Postgraduate Diploma in Management from the Open University of Sri Lanka. He is currently pursuing an MPhil at KDU.

Brigadier Prematilake is a graduate of both the Defence Services Command and Staff College (DSCSC), Sri Lanka, and the Defence Services Staff College (DSSC), India, where he earned the prestigious “Passed Staff College” qualification. He is the first Sri Lanka Army officer to be awarded both the distinguished “Golden Owl” and “Golden Pen” accolades at DSCSC. In addition, he has successfully completed the Senior Command Course in China with honorary credentials and is a graduate of the National Defence College, Sri Lanka.

He has served as a visiting lecturer at the University of Kelaniya and the Open University of Sri Lanka. His research interests include national security, strategic studies, defence technology, and management. Brigadier Prematilake is presently serving as the Chief Instructor of the Army Wing at the Defence Services Command and Staff College, Sri Lanka.



Captain (ND) JHCH Ranaweera joined the Sri Lanka Navy in 2002 and was commissioned in 2004 and in 2005, he secured a Bachelor's degree in Naval Studies in Maritime Warfare from the University of Kelaniya (UoK). A Navigation and Direction specialist, he graduated from the Defence Services Command and Staff College in 2018, securing the Golden Owl of the Navy Wing and Commandant's Honours, and earned a Master of Science in Defence and Strategic Studies from KDU. He also holds a Master of Maritime Policy from the University of Wollongong, Australia. He has commanded several Fast Attack Craft and naval vessels, served as an instructor at the Naval and Maritime Academy, and held staff appointments including Coordinating Secretary to the Secretary, Ministry of Foreign Affairs. For his valour and service, he has been awarded the Rana Soora Padakkama, Uttama Seva Padakkama, and other campaign and long service medals.



Commander Prashan Perera is a versatile and academically accomplished professional with over 22 years of distinguished service in maritime operations, governance and international maritime affairs, having served in the Sri Lanka Navy and Coast Guard. He is a graduate of the General Sir John Kotelawala Defence University with Second Class Upper Division and an alumnus of the Defence Services Command and Staff College, where he was awarded the Commandant's Honours in 2020.

Commander Perera's career encompasses key operational, instructional and strategic policy roles, with extensive international exposure and recognition. His expertise spans maritime safety and security policy, the law of the sea, naval operations and training, defence administration and multilateral coordination.

He has contributed to national defence reviews and represented Sri Lanka in premier international maritime, legal and environmental forums.

CORE VALUES OF DSCSC

Learning Organization: DSCSC identifies itself as a catalyst for learning which seeks expansion of knowledge through realizing the full potential of its personnel. It is expected to uphold excellence in staff roles through dynamism, integrity, devotion, and the ability to learn from both mistakes and accomplishments.

Honour: DSCSC expects that all its members will strive to preserve self-respect, honesty and honour in all their deeds. Members are encouraged to put honour to the test by upholding the honour of the college.

Respect: DSCSC values mutual respect and recognizes uncompromising commitment in the achievement of mutual respect by fulfilling official obligations.

Decorum: DSCSC propagates itself as a pre-eminent defence establishment which upholds rules of decorum which is a fundamental core value of the services. Therefore, the college strives to maintain the highest, yet simple and practical standards in military decorum encompassing ethics, customs and traditions.

Excellence: DSCSC strives for excellence in all its endeavours at all levels which will ultimately contribute to the overall accomplishment of the College's objectives.

Innovation: DSCSC believes in pursuing new creative ideas leading to meaningful innovations by its members to conformity with the principles of high standards.

Punctuality: DSCSC holds punctuality as the bedrock of College's core values.

Professionalism: DSCSC holds professionalism in high esteem and fosters highest standards in professionalism within the establishment.

Mission Command: DSCSC encourages mission command at all levels and recognizes its value as a tool for problem solving and optimizing efficiency. Mission Command facilitates commanders at all levels to exercise their initiative.

Pristine Environment: DSCSC subscribes to serene surroundings of the College providing a conducive learning environment for its officers.

DRIVING TENET-Common Sense: Common Sense permeates the ideals of the Core Values of the DSCSC and it is a testament to the solid foundation the DSCSC inculcates on its officers.

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Defence Services Command and staff College
Sapugaskanda, Makola South 11640,
Sri Lanka
Tel: +94-112964218/ +94-112963792
Fax: +94-112962151
Email: dscscsl@gmail.com / dscsc@army.lk

