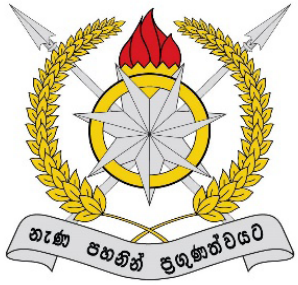

LOGISTICS JOURNAL 2025

ARMY SCHOOL OF LOGISTICS
CLAPPENBURG - TRINCOMALEE

EDITORIAL BOARD

CONTENT

SECTION I

CONTENT

SECTION II

MESSAGE FROM THE COMMANDER OF THE ARMY

It gives me great pleasure to convey my best wishes for the inaugural edition of the Logistics Journal 2025, a significant and timely initiative by the Army School of Logistics.

In the evolving landscape of modern military operations, logistics stands as the backbone of operational success. It is the silent enabler that ensures our forces are sustained, equipped and positioned to meet emerging threats and fulfil our mandate to safeguard the unity, sovereignty and territorial integrity of our Motherland.

This journal serves as a vital platform to disseminate knowledge, share best practices and encourage analytical thinking among officers and professionals engaged in military logistics. As you embark on this timely and relevant endeavour, I am confident that your collective contribution will pave the way for meaningful dialogue, and strategic insight in the field of logistics.

I commend the Army School of Logistics for fostering a culture of research, innovation and continuous professional development within the Sri Lanka Army. May this initiative bring success and recognition, while further enhancing the reputation of the Army School of Logistics as a centre of excellence in producing military professionals.

I trust that the Logistics Journal 2025 will continue to grow in stature and serve as a beacon for intellectual discourse in logistics across the tri-services and beyond. I extend my sincere congratulations to the editorial team, contributors, and all involved in this commendable endeavour.

Lasantha Rodrigo RSP ctf-ndu psc IG
Lieutenant General
Commander of the Army

MESSAGE FROM THE CHAIRMAN OF THE BOARD OF MANAGEMENT

It gives me immense pleasure to pen this message to the Logistics Journal 2025 as the Chief of Staff of the Army and the Chairman of the Board of Management of the Army School of Logistics, to share my thoughts on the importance of logistics in today's military landscape. I am truly honoured to contribute highlighting the critical role played by logistics in shaping modern military operations.

In today's dynamic operational environment, the role of logistics has become increasingly complex and mission-critical. Effective logistical planning and execution are key determinants of operational readiness, mobility, and sustainability of forces in the field. Therefore, developing a well-informed and agile logistics cadre is essential in meeting future challenges.

The Army School of Logistics continues to serve as a cornerstone in developing professional excellence among military logistics officers, providing them with essential knowledge, practical skills, and strategic insight required for modern military operations. The Logistics Journal 2025, a scholarly and professional contribution by the Army School of Logistics further enriches this effort by offering a platform for discussion, innovation, analytical thinking and exchange of ideas, which are crucial for enhancing operational readiness and efficiency.

This journal is a testament to your commitment to professional military education and highlights the importance of reflective practice, innovation, and collaboration in military logistics. It encourages officers to think critically, engage in research, and contribute to the body of knowledge that supports decision making at all levels.

I appreciate the efforts of the Army School of Logistics for its continued dedication to academic and professional excellence. Let this publication inspire further dialogue and development across officer corps.

D K S K Dolage USP nps psc
Major General
Chief of Staff of the Army

MESSAGE FROM THE COMMANDANT
ARMY SCHOOL OF LOGISTICS

It is with great honour and a profound sense of professional pride that I extend this message to the Logistics Journal 2025, an initiative that reflects the enduring mission of the Army School of Logistics to foster excellence in military logistics education.

In modern warfare, logistics has emerged as the silent yet powerful force behind many successes. From planning and procurement to distribution and sustainment, it is logistics that enables capability, assures readiness, increases flexibility and sustains momentum. In an era, marked by complexity, uncertainty and rapid technological change, it is imperative that our logisticians remain adaptive, innovative and professionally astute. This journal plays a crucial role in enabling that vision.

The Logistics Journal 2025 provides a valuable platform for officers, academics and experts to share insights, research and experiences that contribute meaningfully to the professional development of our logistics community. It reflects our commitment to fostering a culture of continuous learning, critical thinking and innovations in the field of logistics. Moreover, this journal stands as a testament to our collective commitment to refining the science and art of logistics, while fostering collaboration and insight among intellectuals, scholars, and future leaders. Let us remain steadfast in our commitment to innovation, collaboration, and the continual improvement of standards in excellence in logistics.

I wholeheartedly extend my heartfelt appreciation to all authors, reviewers and the editorial team whose hard work and dedication have made this publication possible. May this magazine stand not only as a lasting record but also as an enduring source of inspiration for logisticians, military professionals, and academia alike.

R T Lokuthotahewa USP psc
Brigadier
Commandant
Army School of Logistics

SECTION - I

A SUSTAINABLE SUPPLY CHAIN STRATEGY FOR SEAWEED (ALGAE) CULTIVATION INDUSTRY IN SRI LANKA BY UTILIZING TRINCOMALEE ENHANCING ECONOMIC, SOCIAL, AND ENVIRONMENTAL RESPONSIBILITY

Mr Nujith Samarawickrama

ABSTRACT

This study proposes a sustainable supply chain strategy for seaweed (algae) cultivation in Sri Lanka, focusing on the Trincomalee lagoon as a high-potential site for industry development. The initiative aligns with the national vision of fostering a prosperous country through a healthy population by promoting seaweed farming for nutritional consumption and export. Drawing on previous research, data analysis, and surveys, the study identifies ideal conditions for macroalgae growth, particularly in mangrove tide channels, and silty pools. These habitats, though often overlooked due to sediment coverage, are prevalent in Trincomalee and offer significant potential for cultivation.

Seaweed farming presents multiple benefits: economically, it offers income diversification for coastal communities and supports export-oriented growth; environmentally, it contributes to carbon sequestration, improves water quality, and enhances marine biodiversity; socially, it empowers women and marginalized groups through inclusive employment opportunities. Additionally, seaweed is a valuable source of nutrition, with applications in food, cosmetics, pharmaceuticals, and biofertilizers.

The proposed strategy emphasizes the integration of ecological knowledge with economic planning to support food security, income generation, and environmental stewardship. By leveraging Sri Lanka's natural coastal assets and aligning with global sustainability goals, seaweed cultivation in Trincomalee can serve as a model for scalable, climate-resilient aquaculture. The findings confirm the lagoon's suitability for sustainable seaweed farming and highlight its potential to contribute meaningfully to Sri Lanka's long-term development agenda.

Keywords: Sustainable Supply chain, Seaweed cultivation, Trincomalee lagoon, Macroalgae farming, Blue economy, Environmental stewardship, Food security, Sri Lanka aquaculture

INTRODUCTION

The Eastern Province of Sri Lanka, with its extensive coastline and rich marine biodiversity, offers substantial potential for sustainable seaweed cultivation and supply chain development. Trincomalee, as a major port city and maritime gateway, stands out not only for its strategic placement along international shipping lanes but also for its suitability for marine aquaculture, particularly seaweed farming. Traditionally, Sri Lankan seaweed exports have satisfied fertilizer and food industries in Europe and Asia, with India representing the largest regional importing nation. Although global seaweed demand has fueled growth and employment opportunities, especially for women, the industry contends with persistent challenges, including unfavorable climatic conditions, lack of high-quality parental strains, fragmented regulatory oversight, technical barriers, predation, and post-harvest inefficiencies.

Yet, the seaweed sector is poised to contribute significantly to the blue economy vision of Sri Lanka. By integrating global best practices, competitive processing technologies, gender-balanced community engagement, and supportive policy frameworks, Trincomalee can become an exemplar of sustainable, inclusive, and resilient marine supply chain management. Crafting such a strategy necessitates a comprehensive understanding of existing supply chain structures, local climatic and socio-economic realities, regulatory contexts, and the multifaceted opportunities and risks unique to the region.

LITERATURE REVIEW

Contextual Overview of the Seaweed Supply Chain in Trincomalee

Seaweed cultivation and wild harvesting in Sri Lanka have traditionally focused on coastal areas such as Kalpitiya, Mannar, Jaffna, Puttalam, and, increasingly, Trincomalee. Nearly 320 species are involved in cultivation or wild harvest, yet commercial-scale operations remain nascent, constrained by environmental unpredictability and fragmented, smallholder-driven supply networks. Within Trincomalee, the sector's expansion is hampered by insufficient baseline data on optimal biophysical parameters—like salinity, temperature, and nutrient flux—as well as by bureaucratic inertia and competition over marine space among various industries and agencies.

Sri Lanka's broader seaweed supply chain is characterized by contract farming, family-based operations, and a strong presence of women and marginalized

groups in cultivation and post-harvest roles. While the Northern and Eastern provinces, including Trincomalee, have shown growth in both farm numbers and export volumes, operational scalability is limited by knowledge gaps, lack of investment, and underdeveloped logistics and processing infrastructure. Moreover, the sector's high dependence on exporting raw or minimally processed seaweed to India and other Asian trade partners constrains its long-term economic potential.

Socio-economic Importance of the Seaweed Industry in Eastern Province

Seaweed farming is a recognized vehicle for livelihood diversification and poverty alleviation in Sri Lanka's coastal communities. In Trincomalee and adjoining districts, the industry not only generates employment and household incomes but also fundamentally empowers women, who constitute a significant share of the workforce in both production and trading. According to recent studies, women have led entrepreneurial initiatives, formed cooperative networks, and played pivotal roles in local small and medium enterprises (SMEs) associated with the seaweed sector.

Environmental and Climatic Conditions Affecting Cultivation in Trincomalee

Trincomalee's coastal geomorphology—encompassing deep-water harbors, shallow lagoons, extensive seagrass beds, and sheltered inlets provides a natural foundation for seaweed aquaculture. However, the region also grapples with significant climate-induced risks including seasonal monsoon-induced wave action, sea-level rise, cyclonic events, salinity fluctuations from freshwater inflows, and unpredictable rainfall. Excessive heat, freshwater dilution from river outflows, and stronger tidal surges can limit cultivation cycles, harm seed quality, and cause premature detachment of seaweed crops.

Global Best Practices in Sustainable Seaweed Supply Chain Management

Internationally, Asia dominates global seaweed production, with China and Indonesia accounting for over 85% of output. Key success factors from these markets include vertically integrated supply chain models, implementation of traceability tools (such as SeaweedTrace™), and widespread farmer training initiatives. In Indonesia, for instance, the adoption of modern biotechnology for seedling production and expanded use of tissue culture methods has significantly improved productivity and product quality.

Best practice frameworks recommended by organizations like the Food & Agriculture Organization (FAO) emphasize adherence to Good Aquaculture Practices (GAP), regular traceability audits, and sustainable site management systems. Certifications such as the ASC-MSC Seaweed Standard promote environmental stewardship, social responsibility, and stakeholder engagement throughout the production chain. Across both Asian and European contexts, successful supply chains are marked by adaptive logistics, efficient post-harvest handling, and robust quality assurance protocols.

Regulatory and Policy Framework for Seaweed Aquaculture in Sri Lanka

Sri Lanka's policy framework for aquaculture is evolving, with the National Aquatic Resources and Development Authority (NAQDA) and the Department of Fisheries and Aquatic Resources leading regulation, training, and monitoring. However, persistent regulatory challenges remain, including inconsistent licensing processes, absence of a one-stop approval shop for investors, and inadequate zoning for aquaculture development. Furthermore, the lack of formal quality standards, insurance schemes, and coordinated support for seedling banks restricts the sector's scalability.

Stakeholder consultations, public–private partnerships, targeted incentives, and the integration of community-based management models are repeatedly cited as necessary policy directions. Progressive policy recommendations include tax incentives for investors, streamlined licensing, mandatory community engagement in development projects, and explicit support for women's leadership across the supply chain.

Methodologies for Mapping and Analyzing Seaweed Supply Chains

Mapping the seaweed supply chain in Sri Lanka typically involves the identification of key cultivation zones (e.g., Trincomalee), analysis of input-output flows, stakeholder role delineation, and assessment of connectivity to trading and processing centers. Geographic information systems (GIS) mapping, participatory land and resource mapping, and network analysis tools such as the Analytical Hierarchy Process (AHP) and Life Cycle Assessment (LCA) are commonly employed. These methods help in quantifying socio-economic impact, supply and demand dynamics, logistical bottlenecks, and market opportunities.

Data Collection Methods for Seaweed Supply Chain Research

Data on production volumes, employment trends, market prices, post-harvest losses, and gender participation are typically gathered through structured surveys and interviews with local farmers, processors, cooperatives, and traders. Regional authorities, including NAQDA and community-based organizations, collect time-series production data, monitor disease outbreaks, and assess environmental factors. Additional research relies on field-level observation, focus groups, stakeholder consultations, and the triangulation of secondary data from government exports, port records, and international trade data.

METHODOLOGY

Mapping and Analysis Approaches

The supply chain analysis for Trincomalee's seaweed sector synthesizes both qualitative and quantitative data, with an emphasis on stakeholder mapping, participatory resource zoning, and risk identification across each supply chain node. The approach integrates:

a. **GIS-based Supply Chain Visualization.** Layering environmental data (e.g., protected seagrass beds, key harvesting sites, sensitive marine zones) against market, infrastructure, and demographic factors.

b. **Stakeholder Consultation Frameworks.** Engaging community-based organizations, cooperatives, women's groups, private sector partners, and government agencies to ensure comprehensive mapping of roles, interests, and capacity gaps.

c. **Value Chain and Risk Analysis Tools.** Employing AHP, LCA, Failure Mode and Effect Analysis (FMEA), and House of Risk methodologies to evaluate performance, quantify risk probabilities, and prioritize intervention points.

Data Collection Strategies

a. **Primary Data Collection Comprises.** Field surveys and production monitoring: Conducted by NAQDA and local partners to capture real-time information on production, employment, and input usage.

b. **Structured Interviews and Focus Groups.** Capturing nuanced dynamics of gender participation, market access barriers, and community perceptions.

c. **Secondary Data Analysis.** Utilization of port records, Customs export statistics, and time-series market price data to understand macro-trends and export volatility.

RESULTS

Seaweed Processing and Value Addition Technologies

Currently, the Sri Lankan seaweed sector primarily exports dried raw or minimally processed seaweed, with limited local capacity for advanced processing. High-value addition - such as extraction of carrageenan, agar, and other nutraceuticals—is largely unexploited. Technologies such as Alkali-Treated Chips (ATC) for carrageenan and semi-refined powders are common globally but not widely practiced in Sri Lanka due to cost, technical gaps, and an absence of specialized processing facilities.

Logistics and Transportation Network Design for Coastal Regions

Efficient logistics is critical for linking remote rural cultivation sites in Trincomalee to processing facilities, exporters, and international markets. Logistical constraints stem from limited cold storage infrastructure, unpaved or flood-prone access roads, and inadequate maritime transport links. The average supply chain involves manual collection, sun-drying, basic sorting, and aggregation at coastal depots for subsequent shipping to export terminals.

Market Analysis and Economic Viability of Trincomalee Seaweed

The global seaweed market is undergoing rapid growth, with the sector projected to reach a value of USD 69.5 billion by 2034 (CAGR of 13.7%).

Sri Lankan exports, while small in absolute terms, have shown robust increases in recent years with volumes rising from 61,829 kg in 2019 to 594,307 kg in 2023 and corresponding export revenues reaching nearly USD 400,000. Key export destinations include India, South Korea, and Hong Kong.

However, Sri Lankan exporters face challenges in achieving premium pricing due to insufficient quality certification, reliance on raw material exports, and inconsistent supply. The average retail price for seaweed within Sri Lanka (as of July 2025) ranges from USD 1.92 to USD 6.74 per kg, with wholesale prices between USD 1.35 and USD 4.71 per kg, reflecting significant volatility tied to seasonality and quality.

Quality Standards and Certification Schemes in Seaweed Trade

International buyers increasingly demand compliance with safety and sustainability guidelines, such as the ASC-MSC Seaweed Standard, HACCP, and food safety certifications. Lack of local certification and traceability systems in Sri Lanka has constrained access to premium markets, especially in Europe, where buyers require proof of sustainability, contaminant limits, and chain-of-custody documentation.

Environmental Impacts and Blue Carbon Potential of Seaweed Farms

Seaweed cultivation is recognized for its ecological benefits, including carbon sequestration, nutrient removal from coastal waters, and the provision of habitat for marine species. Recent analyses estimate median carbon sequestration rates of 0.5 tons CO2e/ha/year for farmed seaweed, though the immediate economic potential from carbon credits remains modest at current market prices.

Gender and Community Empowerment in Seaweed Value Chains

Seaweed farming is arguably one of the most gender-inclusive rural value chains in Sri Lanka. In Trincomalee, women participate at every step from seedling propagation and planting to drying, aggregation, and marketing. Cooperative models and community-managed enterprises, especially when women hold leadership roles, have been shown to improve household income, social status, and community cohesion.

DISCUSSION

Market Potential, Diversification, and Economic Viability

The seaweed sector's global growth offers immense opportunity for Trincomalee. With industry projections indicating continued expansion into high-value products—like bioplastics, nutraceuticals, food extracts, and carbon credits—value addition and product diversification present the most viable path for long-term economic gains. However, the industry must transition from reliance on raw, bulk exports toward a full-fledged value chain capable of meeting international quality and traceability demands.

a. **Competitive Strategies for Trincomalee.** Investing in local processing capacity for refined carrageenan, agar, and specialty foods/ nutraceuticals, pursuing organic or sustainability certifications and entering premium markets in Europe and North America, developing seaweed- based bio-stimulants and packaging solutions in response to anti-plastic legislation and green consumer movements.

b. **Environmental, Climatic, and Blue Carbon Considerations.** Seaweed farms offer additional environmental services such as improving water quality and buffering ocean acidification. However, over-expansion without environmental zoning, or introduction of invasive or genetically depleted strains, can destabilize marine ecosystems. Integrating seaweed aquaculture with existing blue carbon habitats (e.g., mangroves, seagrasses) and aligning farm growth with best-practice spatial planning reduces these risks and supports both biodiversity and climate mitigation targets.

c. **Empowerment, Inclusion, and Gender-Equitable Development.** A sustainable supply chain emphasizes community ownership, capacity-building, and equitable participation. The strong presence of women in coastal aquaculture presents a unique advantage; however, institutional support, targeted training, and formal recognition of women's labor are needed. National policy commitments must translate into actionable frameworks for gender equity, legal rights, and leadership opportunities within seaweed value chains. Transparent benefit-sharing models such as payment for ecosystem services can further empower local actors, especially women and marginalized groups.

d. **Regulatory Improvements and Policy Innovations.** The regulatory environment for seaweed farming in Sri Lanka is in transition. Achieving a level playing field and investor confidence requires: A single-window approval system for aquaculture investments in Trincomalee, Clear spatial zoning and environmental guidelines, drawing on GIS-based mapping and participatory land-use planning, Mandatory stakeholder consultations and inclusion of women and under- represented groups in decision-making, Financial incentives such as tax relief or subsidized training for certified sustainable operations, Facilitation of international certifications and compliance with emerging traceability standards for food safety and sustainability.

e. **Logistics, Post-Harvest, and Infrastructure Development.** Supply chain optimization should focus on locating processing and aggregation centers close to marine production sites to reduce logistical costs and post-harvest losses, developing intermodal logistics (road–rail–maritime) and resilient cold chains to serve both domestic and export markets, integrating real-time monitoring and digital documentation for quality, certification, and traceability from farm to export, investing in training and capacity-building for smallholder farmers and cooperatives to adopt new technologies and respond to market signals, encouraging public–private partnerships (PPPs) for infrastructure and technology transfer, drawing on lessons from successful international models.

f. **Risk Assessment and Adaptive Strategies.** Emerging business and climate risks require adaptive, science-based responses, crop insurance and disaster risk financing to protect farmers from losses due to storms, disease, or market shocks, early warning systems based on environmental monitoring, with integration into farmer extension services, continuous improvement of seed banks and propagation methods to maintain genetic diversity and disease resistance, community- based ecosystem management to ensure that aquaculture growth complements rather than competes with fishery livelihoods and environmental priorities, robust grievance redress and conflict resolution mechanisms, particularly in zoning disputes or shared-resource contexts.

CONCLUSION

Trincomalee's established maritime infrastructure, geographic advantages, and dynamic coastal communities offer unparalleled potential for positioning Sri Lanka as a hub for sustainable seaweed supply chains in the Indian Ocean region. The realization of this potential, however, hinges on a holistic approach that integrates environmental stewardship, socio-economic inclusivity, technological upgrading, and responsive policy innovation.

By leveraging global best practices such as integrated aquaculture systems, traceability, and value-added product development supported by strong governance, stakeholder participation, and gender empowerment, Trincomalee can lead Sri Lanka's emergence as a competitive player in the international seaweed market. Priorities for the immediate future include investing in quality and certification systems, scaling up value-added processing, enhancing logistics and digital infrastructure, supporting women-led cooperatives, and deepening policy reforms focused on sustainability, equity, and resilience.

A vibrant, sustainable seaweed supply chain in Trincomalee not only aligns with Sri Lanka's blue economy goals but also advances broader objectives of climate mitigation, gender equality, and community empowerment. With coordinated action across public, private, academic, and civil society sectors, Trincomalee's seaweed sector can serve as a global exemplar of socially responsible, environmentally sound, and economically dynamic marine resource management.

REFERENCES

FAO, 2021. Global seaweed production data and aquaculture guidelines. Food and Agriculture Organization of the United Nations.

Perumal, K., Sivaramakrishnan, K. & Arunkumar, K., 2023. Advances in oligosaccharides production from brown seaweeds. Bioengineered, 14(1), pp.1–12. https://doi.org/10.1080/21655979.2023.2252659

SEAWEED PRODUCTION, TRADE AND MARKETING STATUS IN SRI LANKA, 2024. INFOFISH. Available at: https://infofish.org/v4/media/attachments/2024/01/08/article-seaweed-production-trade-and-marketing-status-in-sri-lanka.pdf Sustainable Blue-Green Economy in Sri Lanka and the Indian Ocean, 2024.

INFOFISH. Available at: https://infofish.org/v4/media/attachments/2024/01/08/article-seaweed-production-trade-and-marketing-status-in-sri-lanka.pdf

SLIIT Business School, 2022. The role of green supply chain practices on environmental sustainability. SBS Journal, 2(2), pp.45–58. Available at: https://www.sliit.lk/sbs-journal/assets/downloads/december-2022-volume-2-issue-2/article-3.pdf

Open University of Sri Lanka, 2021. Sustainability performance through green supply chain management (GSCM) practices: A study from large-scale apparel companies in Sri Lanka. OURS Journal, pp.1–14. Available at: https://ours.ou.ac.lk/wp-content/uploads/2021/11/ID-144_SUSTAINABILITY-PERFORMANCE-THROUGH-GREEN-SUPPLY-CHAIN-MANAGEMENT-GSCM-PRACTICES-A-STUDY-FROM-LARGE-SCALE-APPAREL-COMPANIES-IN-SRI-LANKA.pdf

Zhang, Z., Wang, H. & Liu, Y., 2022. Global seaweed farming and processing trends. Food Production, Processing and Nutrition, 4, p.23. https://doi.org/10.1186/s43014-022-00103-2

Jayasuriya, P.M.A. (2003) The status of culture and utilization of seaweeds in Sri Lanka. Rome: Food and Agriculture Organization of the United Nations. Available at: https://www.fao.org/4/ab727e/ab727e06.htm

EXPLORING THE VIABILITY OF DOMESTIC COASTAL SHIPPING FROM TRINCOMALEE FOR MILITARY AND NATIONAL LOGISTICS: A PATHWAY TO SUSTAINABLE AND COST-EFFECTIVE FREIGHT MOBILITY

Major TPA Peris CES
Sri Lanka Army

ABSTRACT

In order to improve national logistics and military mobility in Sri Lanka, this study examines the feasibility of using domestic coastal shipping, especially from the Port of Trincomalee, as a strategic substitute for road-based goods transport. The study finds Trincomalee to be an underutilized but extremely capable port with substantial development potential after a thorough examination of port capacities, transportation cost-efficiency, and environmental impact. Despite slower turnaround times, the results show that sea freight is a more cost-effective option for non-time-sensitive cargo and may be able to ease urban traffic and lessen pollution from heavy road transport. Coastal shipping is supported by national policies and master plans, but implementation is still constrained by institutional, regulatory, and infrastructure hurdles. According to the study's findings, coastal shipping can develop into a scalable and sustainable logistics solution for Sri Lanka with the help of focused reforms, better coordination, and calculated investments.

Keywords: Domestic coastal shipping, Military logistics, Freight mobility, Cargo transportation, Trincomalee harbour

INTRODUCTION

Role of Trincomalee in Country's Economic Hubs

Trincomalee District geographically located between 8° 5' 53" and 8° 59' 52" in the north and 80° 44' 38" and 81° 27' 53" in the east of Sri Lanka (Suthakaran and Rajendram, 2021) and Trincomalee Bay (Koddiyar Bay) is one of the largest and deepest natural harbours in the world which offers plenty of room for marine activities and safe anchoring (Tantray et al., 2025). Based on the findings of Ranjith and Thilanka (2019), Sri Lanka's economy is extremely centralized, around Colombo District of the Western Province which, emerges as the main economic centre and accounting for more than 40% of the country's GDP. Because of its deep natural harbour, strategic location, and unrealized potential for maritime trade and logistics, Trincomalee is an important potential economic centre in this regard.

Present Transport Practices in Logistics in Trincomalee

According to Edirisinghe (2019), land transportation plays a major role in logistical operations. According to national statistics, road transport predominates because of its direct routes and flexible schedules, especially when it comes to connecting Trincomalee to Colombo and interior hubs. According to Warnapura (2024), defence supply chains too are vulnerable to things like traffic jams, maintenance expenses, and interruptions during severe weather.

Existence of Domestic Coastal Shipping at Present

As per Kavirathna (2023), the main purpose of Sri Lanka's irregular and mostly unofficial domestic coastal shipping is the periodic movement of bulk commodities such as cement, clinker and petroleum, between ports such as Colombo, Galle, and Trincomalee. Conquer Shipping Lanka (Pvt) Ltd provides liner agency services in Trincomalee and other major ports. They manage the loading and unloading of containers and bulk cargo, as well as customs clearance and inland logistics support (Conquer, 2021). The GAC Sri Lanka keeps a port agency office at Trincomalee and offer vital port service infrastructure (GAC, 2025). Further, Ceylon Shipping Corporation (CSC) which is a government owned shipping line operates with technical capabilities of moving general, bulk and containerized cargo only to support international trade (CSC, 2021).

Research Question, Significance and Objectives

As per the above background study, it is identified that there is a significance underutilization of domestic coastal shipping though Trincomalee being one of the largest and deepest natural harbours in the world. Therefore, this study examines the possibility to expand the military and national logistics in Sri Lanka by developing domestic coastal shipping from the Port of Trincomalee as an economical and sustainable substitute for land-based goods transportation. Thereby this study aims to ascertain the logistics readiness in relation to potentiality of Trincomalee as a future logistics hub. The objectives of this study are:

a. To assess the Port of Trincomalee's strategic, geographical, and infrastructure potential for domestic coastal shipping operations.

b. To evaluate other modal goods transportation for military and ational logistics in Sri Lanka, including its current practices, constraints, and difficulties.

c. To compare the logistical, financial, and environmental benefits of coastal shipping to traditional inland transportation methods.

LITERATURE REVIEW

Potential of Trincomalee for Domestic Coastal Shipping

According to the Asian Development Bank (ADB), Trincomalee harbour's calm, protected water makes it the perfect place for ship-to-ship transfer, lay-up of vessels, loading and discharging submersible structures and other shipping-related services. This has made Trincomalee harbour a highly desirable occupation for coastal shipping facilities. Further, according to Balachandran (2022), the port handled about 3.2 million tonnes in the year 2016 across dry bulk (such as wheat and clinker), liquid bulk (such as refined petroleum), and general cargo using special jetties for important industrial players like Tokyo Cement, Prima Flour, and Lanka IOC, as well as a multipurpose berth at Ashroff Jetty and afloat repair at Mud Cove.

As Dilrukshi (2019) identified in her study that Trincomalee's limited infrastructure makes it less competitive when compared to ports with inter land connections and container capacity. Further, as many research studies emphasized, modernization allow ports to comply with the evolving competitive demand on shipping in international and domestic whereas Trincomalee port underutilized due to unavailability of modernized functions at present (Jarumaneeroj et al., 2024; Kaluza et al., 2010; Martin-Navarro et al., 2020).

Drawbacks of Land Based Logistics Transport

The sustainability, cost-effectiveness, and efficiency of land-based logistics transport especially the road and rail systems are challenged by a number of serious issues. In many areas, delays, excessive fuel consumption, and higher operating costs are caused by inefficiencies in infrastructure and logistics quality (Lo Storto and Evangelista, 2023). According to He et al. (2018), land transport has significant negative effects on the environment. Additionally, miscalculated demand projections and cost overruns frequently weaken infrastructure projects in the land transportation industry (Flyvbjerg et al., 2013).

Benefits of Coastal Shipping

Numerous studies highlight the significant benefits that coastal shipping has over freight transportation via road and rail, especially in terms of cost effectiveness, environmental performance, cargo capacity, and safety. According to Koba et al. (2024) compared to trucking or rail, sea vessels can transport large volumes at much lower unit costs per tonne-kilometer. Venax.net (2025) expressed that coastal shipping is several times more environmental friendly than truck transportation because maritime transportation emits significantly less CO_2 per tonne km, usually 3–15 g/t km, as opposed to 60–150 g/tkm for trucks. Further, as per Kainaaz (2024) expressed in his blog through sealed containers and fewer handling points, coastal shipping naturally lowers the risk of cargo damage or theft. It also skillfully handles heavy and oversized cargo that may be impractical for over the road transport.

International Best Practices of Domestic Coastal Shipping

As per the studies of Paixão Casaca and Marlow (2009) and Lin et al (2021) countries such as Taiwan, Greece, the United States, the Netherlands, and Australia successfully facilitate domestic coastal shipping practices. In Greece, they effectively utilize coastal shipping system with seasonal demand forecasting for service scheduling, resource allocation, and route planning though application of modernized technologies (Sitzimis, 2024). Moving goods from road to coastal shipping was assessed in a 2020 study on automotive logistics in India (Chandra et al., 2020). Using a mathematical model, researchers discovered that up to one-third of vehicle logistics could be moved to coastal routes given the infrastructure and regulations in the present. Congested road corridor usage is directly reduced by this modal shift. This modal is applicable the Sri Lankan context too.

METHODOLOGY

The pragmatist philosophy, which integrates objective and subjective perspectives to emphasize workable, real-world solutions, serves as the foundation for this study. Using a deductive methodology, the study starts with existing theoretical and empirical data from local and international best practices and assesses considering the level of applicability. Accordingly, a case study approach is used to analyse domestic coastal shipping from the perspective of Sri Lanka's eastern logistics centre. The study uses a mixed method which focusses on primary data sources through interviewing logistics officials

in Sri Lanka Navy and Air Force, and secondary sources like government logistics plans, official reports, published journal articles, cost comparisons, port performance data, and more. The time horizon used for this study was cross sectional. Descriptive and comparative statistical analysis techniques are being used for data analysis quantitative and qualitative analysis purely done as per researcher's perspective on findings. The conceptual framework for the study is as per the fig 1 and operationalization of the conceptual framework is as Table 1.

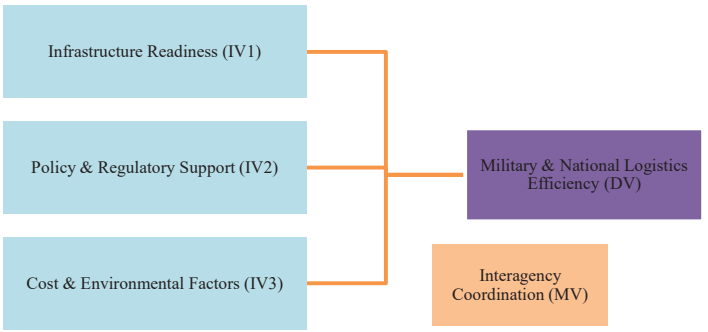

Fig 1: Conceptual Framework of the Study
Source: Prepared by the Author

Table 1: Operationalization of Conceptual Framework

Ser	Variable Type	Variable	Indicator (s)	LV Source	Measurement	Data Source
1.	Independent Variable	Infrastructure Readiness	Port throughput capacity	(Dilrukshi, 2019)	Scale	(SLPA, 2023) (Ministry of Ports, 2025)
2.	Independent Variable	Policy & Regulatory Environment	a. Availability of subsidies b. Customs policies c. Maritime safety laws	(Flyvbjerg et al., 2013)	Nominal	(Ministry of Ports, 2025), (Sri Lanka Coast Guard, 2025),(Theisland, 2019) &(Perera, 2019)
3.	Independent Variable	Cost & Environmental Factors	a. Cost per tonne/km b. CO_2 emissions	(He et al., 2018), (Venax.net, 2025), (Kainaaz, 2024) & (Panjee et al., 2025)	a. Scale b. Scale	(SLConnector, 2025) (iea, 2025)
4.	Mediating Variable	Inter-agency Coordination	a. Joint logistics planning b. MoUs or directives	(Synergies, 2021)	Nominal	(Liyanaarachchi, 2024)
5.	Dependent Variable	Military & National Logistics Efficiency	a. Turnaround time b. Road congestion decrease	(Warnapura, 2024), (Lo Storto and Evangelista, 2023), (Chandra et al., 2020)	a. Scale b. Nominal	Rathnayaka (2023), CSM (2025), and interviews with officers of Sri Lanka Navy and Air Force

DATA ANALYSIS AND DISCUSSION

Port Capacity

According to SLPA (2023), Trincomalee Port's inherent potential as a strategic hub for domestic coastal shipping to support national logistics and military operations can be visualized through the table 2 data. Compared to Colombo and Hambantota, Trincomalee is much underutilized, despite having the largest harbour basin area in Sri Lanka and a moderate staffing level. Nevertheless, it offers high cargo-handling efficiency per employee.

Table 2: Comparison of Sri Lankan Ports by 2023 Statistical Data

Ser	Port	Harbour Basin Area (Ha)	Ship Arrivals (Nos)	Cargo Discharged (In thousand Tonnes)	Cargo loaded ((In thousand Tonnes)	No of employees
1.	Colombo	192	4237	20844	13415	7433
2.	Galle	15.37	23	0.7	0.2	276
3.	Trincomalee	1536	102	1891	123	341
4.	Hambantota	77	447	1304	802	110

Source: SLPA, 2023

Availability of Regulations

Further, by leveraging its deep-water infrastructure, industrially ready hinterland, and enhanced motorway connectivity to Colombo, the Port of Trincomalee is being strategically developed into a major regional economic hub (SLPA, 2023). With an emphasis on improving road and rail connections, national plans such as the Port Master Plan and Trincomalee Zonal Plan encourage its development into a hub for tourism and industrial expansion. In collaboration with the Central Environmental Authority, a Strategic Environmental Assessment is being carried out to guarantee sustainable development.

The Merchant Shipping Act No. 52 of 1971, regulates the operations of domestic coastal shipping in Sri Lanka (Ministry of Ports and Shipping, 2025). Customs regulations also apply to coastal shipping; coastwise trade is subject to the same requirements as international trade, including the need for documentation and duty compliance. Under legislation like the Marine Pollution Prevention Act , the Sri Lanka Coast Guard is responsible for maritime safety, pollution control, and enforcement (Sri Lanka Coast Guard, 2025).

Cost Effectiveness

According to the cost comparison in table 3 below, the most economical form of transportation in logistics is sea freight, especially when shipping bulky, non-urgent items like machinery, tea, rubber, and spices internationally. Air freight, on the other hand, is the most expensive choice and is best suited for high value or urgent items. Despite its moderate cost, land transport is more appropriate for domestic trade. For large volumes of non-time-sensitive cargo, sea freight is therefore the most cost-effective option.

Table 3: Comparison of Sea, Air and Land Transport in Sri Lanka

Ser	Shipping Method	Best for	Approximate Cost	Advantages	Disadvantages
1.	Sea Freight	Bulk goods (tea, rubber, spices, machineries)	Full Container Load (FCL): $1,500–$3,500 per 20ft container. Less than Container Load (LCL): $50–$200 per cubic meter.	a. Law cost for larger quantities b. Availability of high capacity c. Availability of global access	a. Longer transit period b. Involvement of more documentation c. Delays due to weather impacts
2.	Air Freight	Urgent/ perishable goods (medicine, electronics, garment)	Standard Air Freight: $3–$10 per kg. Express Air Freight: $10–$25 per kg.	a. Quick delivery b. Operational efficiency c. Security	a. Higher cost b. Volume restrictions c. Higher Carbon emission
3.	Land Transport	Domestic trade	Truck Transport: $500–$2,000 per shipment (varies by distance). Rail Freight: $200–$1,500 per shipment.	a. Higher flexibility b. Law handling cost	a. Poor domestic infrastructure b. Security issues

Source: SL Connector, 2025

CO2 Emission

According to iea, (2025), which operate to ensure with a broader range of international organizations to ensure reasonable and sustainable energy systems CO2 emissions of logistics transport freights for different modes are as fig 2 below. Considering the CO2 emission level, shipping transportation having the second highest emission level over the past years than other transport modes. In fact, rail having the least CO2 emission than all modes.

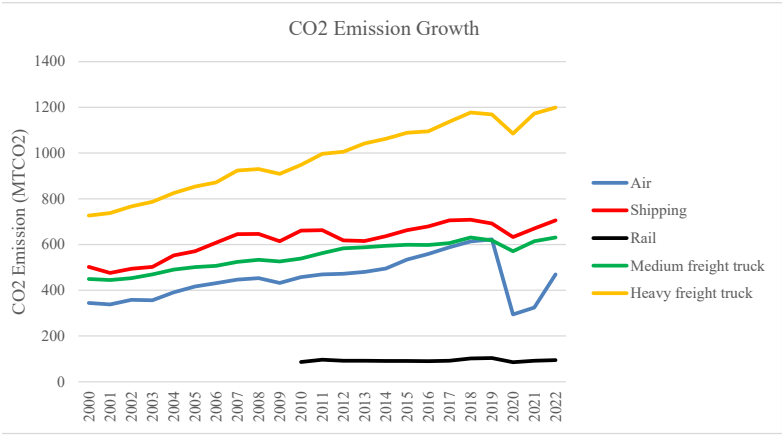

Fig 2 : CO2 Emissions of Transport Modes
Source: iea, 2025

Identifying of Strategic Importance by the Government

Even though Sri Lanka presently practicing limited level of domestic coastal shipping, adequate strategies have been identified and stipulated to enhance the utilization of domestic coastal shipping (Perera, 2019; Theisland, 2019). A National Policy for the Maritime and Logistics Sectors was developed in 2019 in order to promote domestic sea routes along the coast and to regional destinations. It contains a special chapter on coastal shipping that outlines strategic goals and suggested actions. Even though the National Policy for Maritime and Logistics Sectors outlines Sri Lanka's domestic coastal shipping strategies, due to not having cabinet approval, lack of supporting infrastructure and lack of multi modal connectivity the implementation became delayed (SLPA, 2019), (Dailymirror, 2024) and (Mohan, 2023).

Turn Around Time

As per Rathnayaka (2023), CSM (2025), and interviews with officers of Sri Lanka Navy and Air Force following table 4 is prepared by the author to compare the total turnaround time. Since Colombo is considered as the economic hub of the country, Turnaround time was calculated for the freight transit between Colombo and Trincomalee. Estimated total turnaround time is considered as total time taking for loading time, up and down total transition time and unloading time for a single freight transport. Loading and unloading time is depend on the availability of Material Handling Equipment (MHE) and skilled crew at the stations. However, rest time, halt time and maintenance

time are not considered for the calculations. According to the comparison, transportation from Trincomalee to Colombo, domestic coastal shipping is the slowest, with turnaround times ranging from 61 to 69 hours.

Table 4: Turn around Time Comparison of Different Modes

Ser	Mode	Transit Time (hrs)	Loading/Unloading (hrs)	Estimated Total Turn Around Time (hrs)
1.	Rail Freight	6.5 - 8	4 – 8	21 - 32
2.	Road Freight	7 - 9	12 - 24	38 - 66
3.	Coastal Shipping	53	8 - 16	122 - 138
4.	Air Freight	1	1 - 2	4 - 6

Source: Prepared by Author

Decreasing of Road Traffic Congestion

As described in literature review, road traffic congestion in Sri Lanka can considerably reduce by utilizing coastal shipping for military and local logistics freight transitions. It was studied by Kavirathna (2023) that heavy container trucks' impact on urban congestion is widely regarded as a significant obstacle in Sri Lanka's freight transport system. According to the results, about 42% of respondents strongly agreed that urban container-truck congestion is a serious problem, and another 38% agreed that it has a detrimental impact on the overall effectiveness of logistics operations. Therefore, modal shifting of logistics transportation can significantly reduce the road traffic congestion in Sri Lanka.

CONCLUSION

Sri Lanka's national logistics and military freight mobility needs can be effectively and economically met by domestic coastal shipping, especially via the Port of Trincomalee. Trincomalee is underutilized despite having the largest harbour basin among Sri Lankan ports. It has ample space for growth while retaining a high cargo-handling efficiency per employee. Its strategic significance has been acknowledged by national development plans like the Port Master Plan and Trincomalee Zonal Plan, which support its development as a logistics and industrial hub by enhancing infrastructure and obtaining regulatory support.

Despite having comparatively higher CO_2 emissions, shipping is still a more environmentally friendly option than road transportation, which is a significant source of emissions and traffic in cities. The ability of coastal shipping to handle bulk cargo justifies its use for non-time-sensitive freight, even though its turnaround time is longer than that of rail or road.

Implementation has lagged despite the existence of a well-defined National Policy for Maritime and Logistics Sectors since 2019 because of weak multimodal connectivity at regional ports, lack of adequate infrastructures, and a lack of cabinet approval. Modal shifting to coastal shipping, however, can significantly improve road congestion, freight costs, and logistics resilience for both military and civilian operations if it is backed by regulatory frameworks, environmental assessments, and interagency coordination.

As recommendations, Sri Lanka needs to concentrate on improving port infrastructure, expediting interagency coordination, and enacting legislative changes that will facilitate domestic coastal shipping from Trincomalee. Crucial actions include promoting a modal shift through awareness campaigns, starting pilot projects, and enhancing last-mile connectivity. Furthermore, encouraging sustainable practices can be achieved by providing environmental incentives by reducing traffic, lessening the impact on the environment, and strengthening military and national logistics, and finally these actions taken together will allow Trincomalee to become a strategic logistics hub

REFERENCES

Balachandran, P., 2022. Challenges facing the development of Trincomalee port and its environs. TELO. URL https://telo.org/challenges-facing-the-development-of-trincomalee-port-and-its-environs-by-p-k-balachandran/ (accessed 7.9.25).

Barry, K., 2018. DOT to Turn Underused Waterways Into Marine Highways [WWW Document]. WIRED. URL https://www.wired.com/2010/07/dot-turns-underused-waterways-into-marine-highways (accessed 7.11.25).

Chandra, S., Christiansen, M., Fagerholt, K., 2020. Analysing the modal shift from road-based to coastal shipping-based distribution – a case study of outbound automotive logistics in India. Maritime Policy & Management 47.

Conquer, 2021. SERVICES- Conquer Shipping [WWW Document]. URL https://conquershipping.com/services.html (accessed 7.8.25).

CSC, 2021. Ceylon Shipping Corporation [WWW Document]. URL http://www.cscl.lk/ (accessed 7.8.25)

CSM, 2025. RAIL FREIGHT – Ceylon Shipping [WWW Document]. URL https://ceylonshipping.lk/rail-freight/ (accessed 7.29.25).

Dailymirror, 2024. Shipping industry urges regulatory reforms under new government. Daily Mirror.

Dilrukshi, S., 2019. An Analysis of Port Selection Criteria of Shipping Lines in Sri Lanka. Science and Technology 1, 70–83.

Edirisinghe, L., 2019. A Contemporary Appraisal of Logistics Performance in Sri Lanka. https://doi.org/10.13140/RG.2.2.24862.59208

Flyvbjerg, B., Holm, M.S., Buhl, S.L., 2013. How (In)accurate Are Demand Forecasts in Public Works Projects? The Case of Transportation. https://doi.org/10.48550/arXiv.1303.6654

GAC, 2025. Ship agency services Sri Lanka [WWW Document]. GAC Sri Lanka. URL https://www.gac.com/sri-lanka/shipping/ship-agency (accessed 7.8.25).
He, M., Shen, J., Wu, X., Luo, J., 2018. Logistics Space: A Literature Review from the Sustainability Perspective. Sustainability 10, 2815. https://doi.org/10.3390/su10082815 iea, 2025. Transport - Energy System [WWW Document]. IEA. URL https://www.iea.org/energy-system/transport (accessed 7.27.25).

Jarumaneeroj, P., Barnett Lawton, J., Svindland, M., 2024. An evolution of the Global Container Shipping Network: port connectivity and trading community structure (2011–2017). Marit Econ Logist 26, 283–306. https://doi.org/10.1057/s41278-023-00273-x

Kainaaz, 2024. Advantages of coastal shipping in India. URL https://kainaazassociates.com/advantages-of-coastal-shipping-in-india/ (accessed 7.11.25).

Kaluza, P., Kölzsch, A., Gastner, M.T., Blasius, B., 2010. The complex network of global cargo ship movements. J. R. Soc. Interface. 7, 1093–1103. https://doi.org/10.1098/rsif.2009.0495

Kavirathna, C., 2023. Feasibility of establishing an integrated railway-based containerised cargo transport network between the Port of Colombo and free trade zones in Sri Lanka. Journal of South Asian Logistics and Transport 3(2), 103–127. https://doi.org/10.4038/jsalt.v3i2.72

Koba, R., Lipka, P., Kalinowski, M., Czaplewski, K., Witkowska, J., Weintrit, A., 2024. External Transport Costs and Implications for Sustainable Transport Policy. Sustainability 16, 9687. https://doi.org/10.3390/su16229687

Lin, C.-C., Chen, Y.J., Wang, J.-W., 2021. Double matching service preference for promoting short sea shipping: evidence from Taiwan. Maritime Business Review 6, 392–413. https://doi.org/10.1108/MABR-04-2020-0026

Liyanaarachchi, C., 2024. Predictive Modeling of Colombo Port Productivity Using Ship Movement Data. ResearchGate. https://doi.org/10.13140/RG.2.2.20121.33121

lo Storto, C., Evangelista, P., 2023. Infrastructure efficiency, logistics quality and environmental impact of land logistics systems in the EU: A DEA-based dynamic mapping. Research in Transportation Business & Management, Themed Volume on Transport Efficiency 46, 100814. https://doi.org/10.1016/j.rtbm.2022.100814

Martin-Navarro, A., Sancho, M.P.L., Medina-Garrido, J.A., 2020. Business process management systems in port processes: a systematic literature review. IJASM 13, 258. https://doi.org/10.1504/ijasm.2020.109245

Ministry of Ports, 2025. Ministry of Ports, Shipping & Aviation - BERTHING PROGRAMME [WWW Document]. URL https://www.slpa.lk/berthing-programme/ (accessed 7.21.25).

Ministry of Ports and Shipping, 2025. Merchant Shipping Secretariat [WWW Document]. URL https://dgshipping.gov.lk/web/index.php?u (accessed 7.21.25).

Mohan, S., 2023. Coastal Maritime Services Need Revitalisation Too. Ceylon Today. URL https://ceylontoday.lk/2023/04/29/coastal-maritime-services-need-revitalisation-too/? (accessed 7.29.25).

MTBS, 2020. Democratic Socialist Republic of Sri Lanka: National Port Master Plan (No. 50184– 001), 3. Maritime & Transport Business Solutions B.V., Rotterdam, The Netherlands.

Paixão Casaca, A.C., Marlow, P.B., 2009. Logistics strategies for short sea shipping operating as part of multimodal transport chains. Maritime Policy & Management 36, 1–19. https://doi.org/10.1080/03088830802652254

Panjee, P., Kaewchueaknang, V., Amornsawadwatana, S., 2025. A Systematic Literature Review of Cargo Loss Risks in Road Transportation: Impacts and Future Directions. Safety 11, 20. https://doi.org/10.3390/safety11010020

Perera, D., 2019. Dhammika Perera | SRI LANKA 2030 A DEVELOPED NATION. URL https://www.dhammikaperera.lk (accessed 7.29.25).

Ranjith, J.G.S., Thilanka, H.R. a. C., 2019. THE DETERMINANTS OF REGIONAL DEVELOPMENT DISPARITIES IN SRI LANKA: AN EMPIRICAL INVESTIGATION INTO THE REGIONAL DEVELOPMENT POLICY AND ISSUES. Sri Lankan Journal of Business Economics 8.

Rathnayaka, P., 2023. Feasibility of establishing an integrated railway-based containerised cargo transport network between the Port of Colombo and free trade zones in Sri Lanka. Journal of South Asian Logistics and Transport 3, 103–127. https://doi.org/10.4038/jsalt.v3i2.72

Sitzimis, I., 2024. Forecasting methods in Greek coastal shipping: The case of Southwest Crete. Futur Bus J 10, 66. https://doi.org/10.1186/s43093-024-00352-2

SLConnector, 2025. Sri Lanka Shipping Options. Sri Lanka Connector - B2B and B2Clients. URL https://srilankaconnector.com/shipping/ (accessed 7.21.25).

SLPA, 2023. Sri Lanka Port Authority Annual Report 2023.

SLPA, 2019. New Sri Lanka shipping policy sees lower dependence on Indian cargo [WWW Document]. URL https://www.srilankabusiness.com/news/new-sri-lanka-shipping-policy-sees-lower-dependence-on-indian-cargo.html (accessed 7.29.25).

Sri Lanka Coast Guard, 2025. Sri Lanka Coast Guard [WWW Document]. URL https://coastguard.gov.lk/regulations/?utm_source (accessed 7.21.25).

Suthakaran, S., Rajendram, K., 2021. Flood Occurrence and Risk Assessment in Trincomalee District Using Open Source Geo-Spatial Technology.

Synergies, 2021. Improving competitiveness of coastal shipping. Synergies Economic Consulting. URL https://www.synergies.com.au/case-studies/improving-competitiveness-of-coastal-shipping/ (accessed 7.11.25).

Tantray, T.L., Sudhakar, D.R., Charak, S.S., 2025. Trincomalee Harbour in the Indo-Pacific: Strategic Significance and Contemporary Geopolitical Implications for India. Journal of Maritime Research 22, 137–145.

Theisland, 2019. Sri Lanka Ports Authority - News Letter. SLPA.

Venax.net, 2025. Maritime transport - 5 key advantages you need to know. URL https://venax.net/en/maritime-transport-2/ (accessed 7.11.25).

Warnapura, L.L., 2024. Utilising Global Strategic Models to Formulate a Rail Freight Strategy for Sri Lanka. Journal of South Asian Logistics and Transport 4. https://doi.org/10.4038/jsalt.v4i2.82

LOGISTICS SUPPORT FRAMEWORK FOR MILITARY INITIATED TOURISM PROJECTS IN POST CONFLICT AREA

Major ELID Wickramanayake GR
Sri Lanka Army

ABSTRACT

This study develops a comprehensive Logistic Support Framework to guide the planning, coordination, and implementation of military initiated tourism projects in post conflict areas, with a focused case study on Trincomalee. In the aftermath prolonged conflict, strategic military infrastructure of Trincomalee, comprising forts, naval bases, air strips, and controlled coastal zones has gradually transitioned into sites of cultural, religious, and ecological tourism. Recognizing the duel use potential of these military assets, the framework is built upon three strategic pillars as coordinated civil military planning, functional logistics infrastructure, and continuous performance evaluation. The research employed a qualitative methodology, collecting expert's feedback from 35 stakeholders in the tourism sector through open ended interviews, and supported by document analysis from institutional and scholarly sources. The findings underscore the importance of a central coordinating body, the joint Logistic Planning Cell, to harmonies access management, safety protocols, infrastructure upgrades, and stakeholder's responsibilities. Key operational components include transport and access routes, basic essential facilities, and integrated emergency services. A dynamic monitoring and feedback loop ensures adoptive improvements based on operational insights and tourist experiences. The framework has been validated through examples of successful military tourism integration in Trincomalee such as Fort Fredrick, Marble Beach, Girihadu Seya, and naval museum by demonstrating tangible socio economic and reconciliation outcomes. This study concludes that military initiated tourism, when guided by structured logistics planning, offers a sustainable development path for post conflict regions. It also presents replicable model for other regions with enduring military presence and untapped tourism potential.

Keywords: Military tourism, Logistic framework, Post conflict development

INTRODUCTION

Post conflict recovery in fragile demands innovative strategies that balance economic regeneration, historical reconciliation, and national security. Areas such as Trincomalee where rich in natural beauty and military heritage presents unique opportunities for integrated development through military initiated tourism projects. These initiative conceptualized around battle field preservation, defence tourism, and civil military heritage trails, can stimulate regional economies while fostering national unity. However, the success depends heavily on logistics planning, coordination, and sustainability. According to Abeyrathna (2024), the strategic revival of locations like Trincomalee habour as logistics and warehouse nodes supports not only national connectivity but also emerging sectors such as defence tourism. Similarly, the Asian Development Bank (2021) outlines in its Trincomalee Port Development Plan that logistics enabled development must go beyond industrial objectives and support inclusive regional upliftment, where tourism can act as a major socio-economic multiplier. Yet these ventures are logistically demanding due to complex site access, infrastructure limitations, and the need for seamless civilian military coordination.

Trincomalee has emerged as a hub for military initiated tourism with numerous projects developed and maintained by Sri Lanka Army (SLA), Sri Lanka Navy (SLN), and Sri Lanka Air Force (SLAF). At the heart of this effort is Fort Fredrick, a functioning SLA controlled zone that allows public access to key attractions like Koneshwaram Temple and Lover's Leap. The Naval and Maritime Academy and Orr's Hill Navy Museum offer educational tourism with exhibits on naval heritage. The SLAF Marble Beach Resort and Eagles' Golf Links and Chalets at China Bay represent Air Force led eco and recreational tourism. The SLA facilitates access to Girihandu Seya in Thiriyaya, while the SLN manages coastal tourism at Nilaveli, Kuchchaveli, Sampur, and Kallarawa, promoting whale watching, beach stays, and marine conservation. Foul Point Lighthouse and cultural sites like Velgam Vehera, Gokanna Temple, and Hot Wells of Kanniya are supported through military led infrastructure and logistics. These initiatives are coordinated under civil military collaboration, showcasing how defence infrastructure can support heritage, religious, and eco-tourism within a secure logistic framework by ensuring site access, safety, and sustainability in a past conflict environment.

The logistics dimension of tourism in militarised area which ranges from visitor flow management, supply chain security, emergency responsiveness

remain under researched and institutionally fragmented. However, the absence of a structured logistics support framework to operationalize and sustain military led tourism initiatives in post conflict areas hinder the opportunities for military initiated tourism projects. While the logistic infrastructure of Sri Lanka has been advanced with the vision of becoming a regional maritime and logistics hub, the improvements remain unevenly distributed and often neglect inland and historically sensitive sites. Don (2021) highlights that the specific logistic gaps faced by military units operating in post conflict areas, particularly the challenges of moving personnel and resources through terrain that lacks modern transport or storage facilities. This becomes a critical bottleneck when such regions are simultaneously promoted as emerging tourism zones without adequate support. Further, Senarathne (2024) identifies persistent transportation and maintenance issues that hinder smooth logistical operations by formations stationed in Trincomalee, underscoring the urgency for a tailored logistics strategy that merges military efficiency with tourism adoptability.

This study aims to design a logistics support framework that enables the planning, execution, and sustainability of military initiated tourism projects in post conflict areas of Sri Lanka with reference to Trincomalee. The scope focuses on logistics operations required to convert historically significant military areas into accessible, secure, and economically viable tourist destinations. It encompasses infrastructure rehabilitation, multi modal transport solutions, human resource support, supply chain integration, and stakeholder coordination mechanisms. Drawing insights from regional port development strategies, civil military logistics principles, Indo-Pacific security logistics model, this research attempts to bridge the knowledge and operational gap between defence logistics and tourism development. Further, the study focusses on achieving the objectives as to analyse current military logistic capacities relevant to tourism in Trincomalee, to identify logistical gaps and stakeholder coordination issues in ongoing or proposed military heritage ventures, and to develop a comprehensive, adaptable logistics framework that supports sustainable military led tourism in Trincomalee as a post conflict areas.

METHODOLOGY AND EXPERIMENTAL DESIGN

This study employed a qualitative exploratory approach to investigate and propose a logistic support framework suitable for military initiated tourism projects in post conflict areas of Sri Lanka, particularly in Trincomalee. Military infrastructure and tourism development, a qualitative design was most appropriate for capturing the complexity of stakeholder dynamics, operational challenges, and institutional coordination mechanisms. The research aimed not only to understand logistics deficiencies but also to explore how military assets and infrastructure can be effectively aligned with sustainable tourism objectives. This approach enabled in depth examination of context specific issues that quantitative methods may have overlooked.

Data collection involved a combination of documentary analysis, expert interviews, and stakeholder consultation. Firstly, a review of key institutional publications, defence logistics manuals, government development plans, and academic sources were undertaken. These included documents such as the Trincomalee Development Plan of Asian Development Bank. These secondary sources provided foundational knowledge about existing infrastructure capabilities, gaps in civil military logistics integration, and national development ambitions for Trincomalee as a regional hub. A thematic content analysis was conducted on these document to extract relevant data on logistics categories such as transport, engineering, security, supply chin support, and public engagement in military managed areas.

To strengthen empirical validity and contextual relevance, primary data was collected through open ended questions administered to 35 experts working in the tourism sector in Trincomalee. These included local tourism agents, hotel managers, independent tourist guides and regional development consultants. The questions were designed to align with research aim and objectives, focusing on logistic barriers, coordination challenges, and infrastructure gaps affecting tourism initiatives involving military administrated heritage sites. The questions examine the logistic challenges of in military managed tourism areas in Trincomalee, the requirement of essential infrastructure supports, and options that military can support for the development of infrastructure for military initiated tourism projects in Trincomalee.

Data analysis followed a thematic approach. Responses from both documentary sources and expert feedback were coded inductively to identify emerging patterns relevant to the proposed logistics framework. Comparative mapping

was done to align the needs identified by tourism experts with existing military logistics practices and policy directives. This process enabled the identification of practical gaps and informed the development of a context sensitive logistics support model. The proposed framework was then validated through senior level logistics and tourism professionals. These individuals were invited to review the initial framework structure and provide feedback over repetitive rounds. These insights helped refine the prioritization of logistics components, highlight implementation barriers, and ensure alignment with both national tourism strategies and military operational protocols.

While the methodology ensured a comprehensive view of the issue, limitations were acknowledged. Due to the sensitive nature of military logistics, access to detailed operational data was restricted. Moreover, as the study focused on one geographical area, the generalisability of the findings is limited. Nevertheless, the approach provided rich, grounded insights to formulate a scalable and replicable logistics support framework for military tourism partnerships in post conflict areas.

RESULTS

The data presented in this section was collected from 35 tourism sector experts operating in Trincomalee. The sample was selected based on the active involvement in regional tourism planning, hotel and resort operations, tour guidance, event coordination, and public private partnerships linked to post conflict area development. The experts provided responses to a structured set of open ended questions. Their responses were coded and grouped under two headings as key logistics challenges affecting military initiated tourism projects and proposed logistics improvements necessary for enhancing the feasibility and sustainability of tourism operations in such areas.

Key Logistics Challenges

A range of logistical obstacles was identified by the respondents when asked to describe the difficulties faced in promoting and managing tourism projects in Trincomalee where military presence is prominent. The frequency of each challenge mentioned is presented in table 1.

Table 1: Key Logistics Challenges

Challenge	Number of Experts (n = 35)
Access restriction due to military control	26
Inadequate transport infrastructure	24
Lack of civil military coordination	22
Poor basic essential facilities	20
Security overreach discouraging tourism	15
Limited emergency response system	13

Source: The Author Developed Based on the Results of Questions

The second most commonly noted challenge was the inadequacy of transport infrastructure. Many of potential tourism attractions of Trincomalee including coastal cultural and historical sites are not easily reachable due to poor road conditions or lack of designated public transport routes. Respondents state that visitors require special arrangements for site access, which deters mainstream tourism operators. These issues reflect the concerns raised in the Trincomalee Port Development Plan by the Asian Development Bank, which highlights the fragmented logistics planning in the region.

Lack of civil military coordination was another major theme, identified by 22 respondents. Tourism professionals described frequent disconnects between civilian authorities, tourism boards, and military managing the infrastructure. One respondent notes that there is not always clear from whom they need to coordinate with to organize access a site, the chain of command is not transparent, and tourism is often treated as a secondary concern. These sentiments reflect the need for a centralized logistics coordination mechanism. Further, challenges included poor basic essential facilities, such as lack of sanitation, shaded rest stops, signage, and emergency first aid access at military managed sites. Some sites, although rich in heritage or strategic maritime history, lack even the basic logistics support for safe public use. Additionally, security overreach was cited by 15 respondents, referring to over regulation, inspections, or armed presence that can be perceived as intimidating to domestic and international tourists. Lastly, limited emergency response system was identified as significant weakness, in coastal areas prone to natural risks or health emergencies.

Suggested Logistics Improvements

The 35 experts proposed specific logistical and institutional interventions that they believe would improve tourism feasibility in areas like Trincomalee where military presence is integrated into post conflict recovery. The Table 2 illustrate the suggested logistics improvements.

Table 2: The Suggested Logistics Improvements

Improvement	Number of Experts (n = 35)
Upgrade transport and road access	728
Joint civil military coordination units	25
Enhanced basic essential facilities	22
Integrated emergency services	18
Clear guidance for tourist access	17

Source: The Author Developed Based on the Results of Questions

Alongside the identification of challenges, the tourism experts also provided suggestions for improving logistics conditions in Trincomalee. The most consistent recommendation, cited 28 respondents was to upgrade transport and road access to form major tourist zones areas including roads leading to former military controlled areas, harbours and coastal observations points. Experts advocated for shared use routes and civilian military agreement that balance security with open movement. These proposals resonate with Abeyrathna (2024), as emphasized the importance of integrating warehousing and transport logistics to boost accessibility of Trincomalee. Joint civil military coordination units are proposed by 25 respondents, who recommended forming integrated planning cells or liaison officers to oversee the logistics and tourism interface. Such units would ensure a more seamless process for event planning, tourist movement, crisis management, and infrastructure upkeep. This also significances the proposals which encourages cross sectional coordination in national development zones. Further, 22 experts called for enhanced basic essential facilities, noting the need for investment in rest areas, toilets, signage, eco pathways, and interpretive centers at military-controlled tourism sites. Lack of such basic infrastructure reflects poor efforts of Sri Lanka to brand itself as a logistics and tourism hub in the Indo-Pacific region.

Integrated emergency services, including fire response, medical assistance, and disaster preparedness protocols are identified as essential by 18 experts. Respondents mentioned the civilian tourists feel vulnerable at times due to the absence of non-military support systems during off peak seasons or in isolated areas. Moreover, 17 respondents also emphasized the need for cleat guidelines for access of tourists, including transparent process for obtaining entry to military zones and uniform ticketing systems.

DISCUSSION

The study set out the aims of developing a practical and sustainable logistics support framework for military initiated tourism projects in post conflict areas, with Trincomalee serving as the case study. Based on expert feedback from 35 tourism stakeholders and using qualitative thematic coding and frequency based synthesis, the discussion reflects how the results meet the three objectives of the study. The findings reinforce the necessity of an integrated logistics approach that balances military assets with tourism facilitation in post conflict regions, enabling responsible access, and infrastructure upgrading and visitor management.

As revealed in the results, the most pressing issue identified by experts was access restrictions due to military control, followed closely by inadequate transport infrastructure and poo civil military coordination. These reflect the core logistical hindrances that prevent seamless connectivity, both physical and administrative, between tourism operators and military authorities. The structured qualitative analysis supported by frequency based coding showed that over 70% of the experts highlight the lack of clarity, consistency, and civilian friendly protocols in accessing military controlled zones. This limitation critically affects the mobility of tourists, the visibility of tour packages, and event coordination, especially in areas like Ford Fredrick, Marble Beach, and Naval museums. These challenges are aligned with the finding in the Journal of Logistic Conference 2024, published by the Naval and Maritime Academy (2024) and observations of Don (2021), who emphasized that militarised control zones without tourism adopted logistic policies create systematic access and safety barriers for public engagement.

The most commonly proposed improvements included transport infrastructure upgrades, joint civil military coordination units, and enhanced basic essential facilities. These proposals were thematically coded and qualified, with the top suggestion as transport upgrading which is cited by 28 out of 35. Experts

describe the urgent need for better access roads, marked heritage trails, signage, parking, and safety fencing around sensitive or partially restricted zones. Similarly, the recommendation to create integrated planning cells was cited by 25 experts who called for permanent or rotational military civilian logistics teams that could oversee movement approvals, support tourism event logistics, and respond to emergencies. Further, facilities such as toilets, seating shelters, water points, and shaded resting areas are reported a minimal or absent in military tourism sites. These deficiencies can result in reduced dwell time and negative visitor experiences. The inclusion of integrated emergency services such as mobile health units and rescue protocols was also a strong theme in the feedback of the experts. This corresponds to broader logistics and safety standards for tourism identified by the International Transport Forum (2024), and the Sri Lanka Export Development Board (2018).

The study develops a functional framework as Logistics Support Framework for Military Initiated Tourism Projects. This model positions both military assets and tourism sector needs as dual inputs feeding into a Central Integrated Logistic Planning Cell. This cell serves as a multi-agency interface that allocates responsibilities for access, infrastructure, and safety protocols. Three operational branches are proposed as transport and access routes which cover shared use roads, marine access points, and secure entryways, upgrade basic essential Facilities which address sanitisation, accessibility, and user friendly site amenities, emergency and safety services which include firefighting units, mobile health, and safety signage. These components collectively feed into a sustainable tourism flow, measured by improved visitor movement, site capacity handling, and community satisfaction. The monitoring of feedback loop at the base of the framework ensures continual improvement trough tourism authority reports, tourist feedback, and operational reviews, which are sent back into the logistics cell for policy or process revision.

The proposed framework, grounded in expert insights and validated through structured qualitative synthesis, serves as a viable roadmap for military and tourism authorities aiming to convert post conflict areas in to sustainable economic and heritage tourism hubs. It offers a scalable model that may be adopted in other regions with dual use civil military assets. The figure 1 illustrates that the proposed logistic support framework for military initiated tourism projects in post conflict areas.

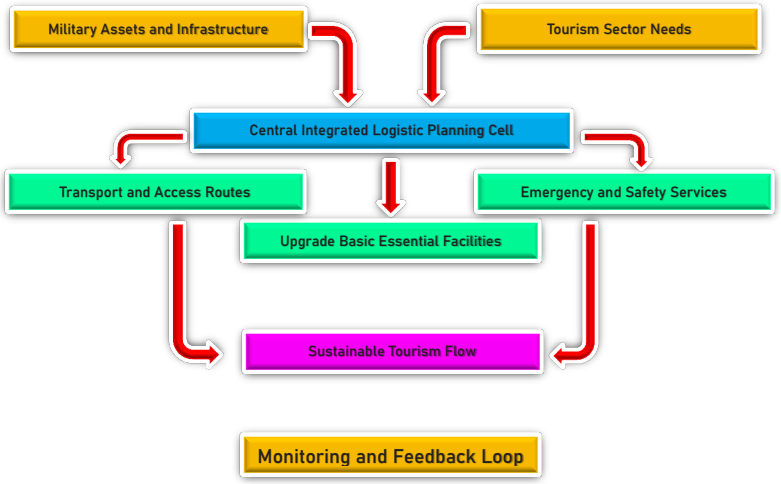

Figure 1: The Proposed Logistic Support Framework for Military Initiated Tourism Projects in Post Conflict Areas
Source: The Author Developed Based on the Results

CONCLUSION

In conclusion, the development of a Logistic Support Framework for military initiated tourism projects in post conflict areas such as Trincomalee offers a strategic pathway to harness underutilized military infrastructure for national development and reconciliation. The integration of military assets, ranging from forts, airstrips, and naval museums to manage coastal zones which has already enabled structured, secure, and sustainable tourism in previously restricted regions. Through the establishment of a Joint Logistic Planning Cell, coordinated efforts between military units, civil authorities, and tourism stakeholders can ensure that logistical components such as access routes, basic essential facilities, and emergency services are effectively planned and maintained. The inclusion of a monitoring and feedback loop strengths this framework by enabling continuous improvement and accountability. As demonstrated in Trincomalee, tourism initiatives supported by the SLA, SLN, and SLAF have contributed to economic revitalization, cultural preservation, and community engagement. This model reflects the potential for development strategy led by security forces to coexist with peacebuilding efforts, offering replicable lessons for other post conflict regions. With proper policy backing, stake holder coordination, and sustained investment, the framework can serve as cornerstone for transforming military assets into catalysts for inclusive, long term regional growth.

REFERENCES

Abeyrathna, G.R.T.B. (2024) 'Navigating the future: innovations and sustainability in supply chain management – introducing a warehouse to Trincomalee Harbour', Research Symposium on Supply Chain Management & Logistics, Colombo, 28 February. Colombo: National Institute of Business Management, pp. 1–?. Available at: https://www.researchgate.net/publication/378525157_Navigating_the_Future_Innovations_and_Sustainability_in_Supply_Chain_Management_Introducing_a_Warehouse_to_Trincomalee_Harbour (Accessed: 7 July 2025).

Asian Development Bank (2021) National Port Master Plan: Technical Assistance Completion Report. Project Number 50184-001. Manila: Asian Development Bank. Available at: https://www.adb.org/sites/default/files/project-documents/50184/50184-001-tacr-en_17.pdf (Accessed: 6 July 2025).

Don, J. (2021) 'Military logistics management problems in rural areas in Sri Lanka', ResearchGate, 31 October. Available at: https://www.researchgate.net/publication/355789479_MILITARY_LOGISTICS_MANAGEMENT_PROBLEMS_IN_RURAL_AREAS_IN_SRI_LANKA_Military_logistics_management_problems_in_rural_areas_in_Sri_Lanka (Accessed: 5 July 2025).

Fonseka, B. and Raheem, M. (2009) Trincomalee High Security Zone and Special Economic Zone. Colombo: Centre for Policy Alternatives. Available at: https://cpalanka.org/wp-content/uploads/2009/11/Trincomalee%20High%20Security%20Zone%20and%20Special%20Economic%20Zone.pdf (Accessed: 5 July 2025).

International Transport Forum/OECD (2024) Urban Logistics Hubs, ITF Roundtable Report No. 195. Paris: OECD Publishing. Available at: https://www.itf-oecd.org/sites/default/files/docs/urban-logistics-hubs.pdf (Accessed: 5 July 2025). doi: 10.1787/da4dee9f-en.

Naval and Maritime Academy (2024) LLMC Journal: Journal of Logistics Conference 2024, Trincomalee, 8 June 2024. Trincomalee: Naval and Maritime Academy. Available at: https://nma.navy.lk/wp-content/uploads/2024/06/LLMC-Journal-2024-1.pdf (Accessed: 5 July 2025).

Perera, S. (2023) 'Small nations, big impact: The significance of Sri Lanka's strategic position in Indian Ocean trade and geopolitics', ResearchGate, 18 October. Available at: https://www.researchgate.net/publication/393170812_Small_Nations_Big_Impact_The_Significance_of_Sri_Lanka%27s_Strategic_Position_in_Indian_Ocean_Trade_and_Geopolitics (Accessed: 5 July 2025).

Senarathne, H.M.T. (2024) 'Military logistics management problems in rural areas in Sri Lanka: A case study on transportation issues faced by 22 Division deployed in Trincomalee', LLMC Journal 2024: Journal of Logistics Conference, 8 June. Trincomalee: Naval and Maritime Academy, pp. 22–27. Available at: https://nma.navy.lk/wp-content/uploads/2024/06/LLMC-Journal-2024-1.pdf (Accessed: 5 July 2025).

Sri Lanka Export Development Board (2018) Sri Lanka Logistics: National Export Strategy 2018–2022. Colombo: Sri Lanka Export Development Board. Available at: https://www.srilankabusiness. com/pdf/nes/sri-lanka-logistics-4-3-web.pdf (Accessed: 5 July 2025).

https://www.tripadvisor.com/Attraction_Review-g424963-d4470855-Reviews-Trincomalee_Beach-Trincomalee_Eastern_Province.html.

ADAPTIVE REUSE OF MILITARY ARCHITECTURE FOR SUSTAINABLE TOURISM: EXPLORING POTENTIAL IN TRINCOMALE

Major W K N Gunaratna CES
Sri Lanka Army

ABSTRACT

The study investigates how this historic site could be repurposed for tourism development while retaining its cultural and strategic value. While employing a mixed-methods method, a structured questionnaire was conducted with 200 purposively selected participants from local residents, tourists, military officers, and professionals. The results indicate that the public is in favor of the adaptive reuse strategies, including guided heritage tours, military museums, and cultural events, with major concerns on matters such as security, heritage integrity, and community benefit. This study examines the possibility to adopt Fort Frederick as foremost sustainable tourism heritage site in post-conflict regions through adaptive reuse with stakeholder engagement, ensuring sensitive planning. This research adds to the wider discourse of preserving military heritage versus development.

Keywords: **Adaptive reuse, Military architecture, Sustainable tourism, Fort Frederick, Heritage conservation**

INTRODUCTION

Trincomalee, located on the Northeastern coast of Sri Lanka, is a region of immense historical, cultural, and strategic importance. Its natural deepwater harbor, rich biodiversity, and cultural diversity have long made it a site of attraction for traders, colonizers, and spiritual seekers alike. Among its most prominent landmarks Fort Frederick, stand as a colonial-era military fortification that has remained under military control which coexists with public interest due to the presence of the revered Koneswaram Hindu Temple nestled within its premises.

While Trincomalee's geographical positioning and resource availability have been recognized for their logistical potential, its military infrastructure particularly sites of historical and architectural significance remain underutilized in the tourism sector. In an era where sustainable development and economic

diversification are essential national priorities, the adaptive reuse of military architecture presents an innovative opportunity. Rather than remaining closed or restricted zones, such sites can be sensitively reimagined to serve broader social, cultural, and economic purposes without undermining national security or heritage value.

The concept of adaptive reuse refers to the process of repurposing buildings for viable new uses while retaining their historic and architectural integrity. Globally, military architecture has been transformed into museums, heritage parks, educational centers, and tourism nodes. These examples reveal how strategic design and planning interventions can convert underutilized military assets into drivers of local economic development and cultural enrichment. In the context of Sri Lanka, , such approaches are still emerging especially in the eastern Province and require careful navigation due to the dual imperatives of security and preservation.

This study focuses on Fort Frederick, a prime example of Colonial Military Architecture, to explore its potential for adaptive reuse as a sustainable tourist destination. The presence of the Koneswaram Temple within the fort already encourages a stream of pilgrims and tourists, thereby establishing a foundation for broader tourism-related interventions. Additionally, the pathway an alley that traverses the fort illustrates the possibility of integrated civilian-military space, making this location ideal for further investigation.

The objectives of this study are threefold:

a. To assess the current Architectural and functional state of Fort Frederick and its surrounding tourism interactions.

b. To evaluate the potential for adaptive reuse of the fort as a heritage tourism site that aligns with principles of sustainability and cultural sensitivity.

c. To propose architectural and planning recommendations for optimizing the fort's use in ways that contribute to the national economy while preserving military relevance and historic character.

Through this study, the paper seeks to contribute to the dialogue on sustainable tourism development in Trincomalee by highlighting the feasibility of converting underutilized military sites into inclusive, economically beneficial, and culturally respectful public spaces.

LITERATURE REVIEW

Adaptive Reuse in Architecture

Adaptive reuse is increasingly recognized as a sustainable architectural strategy that extends the life cycle of buildings while preserving their cultural and historical significance. According to Plevoets and Van Cleempoel (2011), adaptive reuse involves the process of repurposing buildings for new uses while maintaining their architectural integrity. It is particularly valuable in contexts where historical structures are abundant yet underutilized. This approach not only reduces the significance of the environmental footprint associated with demolition and new construction but also contributes to cultural continuity and urban identity (Bullen and Love, 2011).

In military contexts, adaptive reuse is often applied to decommissioned or strategically reclassified facilities. These buildings, due to their robust construction and historical relevance, offer significant potential for conversion into public, commercial, or cultural spaces. However, their transformation requires sensitive interventions that respect both heritage and the functional needs of new users (Langston et al., 2008).

Military Architecture and Its Tourism Potential

Military architecture, including forts, garrisons, and bunkers, reflects layers of history, colonial influence, and geopolitical dynamics. These structures often occupy strategically valuable sites, such as hilltops, coastlines, or urban cores, making them desirable for tourism development. As argued by Douet (2012), former military sites can become meaningful cultural tourism destinations if adaptive reuse strategies are aligned with heritage conservation standards.

Case studies from Europe, such as the transformation of the Citadel of Namur in Belgium or the reuse of former British naval bases in Malta, demonstrate how military architecture can be reimagined for tourism while fostering local economic growth. These examples often involve public-private partnerships, heritage zoning, and interpretive planning that connect visitors with the historical narratives embedded in the architecture (Orbaşli, 2008).

In the South Asian context, India and Sri Lanka share a colonial past that left behind a considerable number of military installations, many of which are located in regions of natural and cultural significance. Forts like Fort Kochi in India and Galle Fort in Sri Lanka have already been integrated into tourism circuits through adaptive reuse and conservation. However, in post-conflict

regions like Trincomalee, such transformations remain limited due to ongoing military occupation or lack of integrated planning.

Sustainable Tourism and Heritage Conservation

Sustainable tourism advocates for the development of tourism practices that are environmentally responsible, culturally respectful, and economically viable. According to the United Nations World Tourism Organization (UNWTO, 2018), sustainable tourism should contribute positively to the protection of heritage and support the wellbeing of host communities. Adaptive reuse aligns closely with this paradigm, offering a means to introduce tourism infrastructure without extensive new development.

Heritage tourism, a key branch of sustainable tourism, thrives on the conservation and interpretation of historical sites. As emphasized by Timothy and Boyd (2006), successful heritage tourism relies on accessibility, authenticity, and stakeholder engagement, particularly when dealing with culturally sensitive or religiously significant locations. In the case of Fort Frederick, which houses the Koneswaram Temple, the intersection of military, religious, and touristic uses presents both opportunities and challenges for sustainable development.

In Sri Lanka, the concept of sustainable tourism is gaining ground, especially in the aftermath of the civil conflict. However, balancing heritage conservation with tourism demand, especially in militarized zones, remains a complex issue. Perera and Fernando (2020) argue that strategic planning and cross-sector collaboration are essential for unlocking tourism potential in such regions. This includes acknowledging the role of the military not only as a stakeholder in national security but also as a potential facilitator of tourism development through adaptive reuse.

Gaps and Opportunities in the Sri Lankan Context

While international literature offers a wealth of case studies on adaptive reuse of military sites, there is limited research focusing on Sri Lanka's Military Architecture in relation to tourism. Fort Frederick represents a unique case where public access already coexists with military function due to the religious significance of the site. This presents a model for controlled, respectful tourism expansion based on adaptive reuse principles.

Moreover, the Eastern Province, with its ethnic diversity, coastal geography, and underdeveloped tourism infrastructure, stands to benefit significantly from heritage-driven tourism initiatives. As highlighted by Samarathunga

and Wijesinghe (2015), regions like Trincomalee can serve as laboratories for sustainable tourism models that integrate military, environmental, and cultural dimensions.

METHODOLOGY

This study adopts a qualitative-dominant mixed-methods approach to explore the adaptive reuse potential of Fort Frederick for sustainable tourism in Trincomalee. The research design combines field observation, literature analysis, and primary data collection via a structured questionnaire to gather stakeholder perceptions. This triangulated methodology enables a more comprehensive understanding of both physical and social dimensions related to the adaptive reuse of military architecture.

RESEARCH DESIGN

The research follows an exploratory-descriptive format to examine how historical military architecture can be reused within a contemporary tourism framework. The central case study is Fort Frederick in Trincomalee, selected for its historical significance, strategic location, current dual-use status (military and civilian), and relevance to post-conflict development.

DATA COLLECTION METHODS

Site Observations. Direct on-site observations were carried out to examine the fort's existing spatial organization, architectural features, levels of preservation, accessibility, and informal tourism activities. Notes, sketches, and photographs were taken to support spatial analysis.

Literature and Document Review. Secondary data was collected through academic literature, government publications, development plans, and historical records relevant to adaptive reuse, heritage conservation, and Trincomalee's tourism development.

Questionnaire Survey. A structured questionnaire was administered to four key stakeholder groups:

a. Local community members (including vendors and residents).

b. Tourists and pilgrims visiting Fort Frederick and Koneswaram Temple.

c. Officers from the Sri Lanka Army (responsible for site security).

d. Professionals and academics in architecture, heritage, or tourism fields.

e. The questionnaire aimed to identify.

f. Stakeholder awareness of Fort Frederick's heritage value.

g. Perceptions of the site's current usage and tourism potential.

h. Opinions on the feasibility and benefits of adaptive reuse.

i. Concerns or limitations, especially from the military perspective.

The survey included 15 closed and open-ended questions and was distributed in both Sinhala and English. Responses were collected using printed forms and digital formats via Google Forms over a period of two weeks.

Sampling and Participant Profile

A purposive sampling strategy was employed to engage individuals directly connected to, or with significant interest in, the Fort Frederick site. The sample was carefully selected to include diverse perspectives on adaptive reuse, heritage preservation, tourism, and military utility. A total of 200 respondents participated in the survey, distributed equally among four key stakeholder groups:

a. **Local Residents and Small-Scale Business Vendors - 50 Numbers.** These participants live or operate in the vicinity of Fort Frederick and represent community-level engagement and economic dependency on tourism.

b. **Tourists and Pilgrims - 50 Numbers.** Individuals visiting Fort Frederick and Koneswaram Temple, representing the perspectives of both heritage tourists and religious visitors.

c. **Military Officers (Non-sensitive Personnel) - 50 Numbers.** Serving officers stationed in or familiar with the area, providing insight into security concerns and institutional limitations related to adaptive reuse.

d. **50 Professionals and Academics.** Experts in the fields of architecture, heritage management, tourism development, and urban planning, contributing informed perspectives on feasibility and design strategies.

This balanced sampling approach ensured a multi-dimensional understanding of the site's current role, public perception, potential for adaptive reuse, and its broader socio-economic and cultural implications for Trincomalee.

Data Analysis Techniques

The collected data was analysed using thematic analysis. Open-ended responses from the questionnaire were coded and grouped into themes such as "awareness of heritage value", "reuse opportunities", "accessibility", "security concerns", and "tourism infrastructure needs".

Closed-ended responses were tabulated and quantified to identify patterns and levels of agreement and disagreement among stakeholder groups. The data was then compared with site observations and literature findings to identify consistent insights and conflicting viewpoints.

Limitations of the Study

a. **Access Restrictions.** Due to military control, full architectural surveys or drone-based mapping of the fort were not permitted.

b. **Sample Size.** The number of military personnel and professional respondents were relatively limited due to time constraints and clearance requirements.

c. **Language and Cultural Sensitivity.** Some responses may have been influenced by cultural perceptions of military sites or hesitation to criticise public institutions.

Despite these constraints, the methodology enabled a reasonably balanced understanding of the adaptive reuse potential of Fort Frederick from multiple viewpoints.

FINDINGS AND DISCUSSION

This section presents the key findings derived from site observations, stakeholder interviews, and secondary document analysis. The discussion is focused on major themes identified during data analysis and linked to the theoretical perspectives outlined in the literature review.

Architectural and Historical Significance of Fort Frederick

Fort Frederick, originally built by the Portuguese in the early 17th century and later reinforced by Dutch and British colonial powers, is one of the oldest surviving military structures in Sri Lanka. Its location at Swami Rock provides strategic coastal views of Trincomalee's natural harbor which is historically considered to be one of the finest deep-water ports in Asia. The fort demonstrates distinct architectural characteristics such as thick laterite and granite walls, bastions, and colonial layout geometry inherent to the European fortifications.

Site visits confirmed that several of the fort's original elements remain intact, albeit weathered. Features such as the bastions, vaulted passageways, guard towers, and drainage channels show high reuse potential, especially for interpretation and visitor experiences. However, some parts have been modified or obscured due to modern military installations.

Discussion. The architectural integrity of the site is largely intact, presenting strong potential for adaptive reuse with minimal structural intervention. Its unique blend of military, religious (Koneswaram Temple), and colonial history enhances its eligibility for integrated heritage tourism development, similar to models seen in Galle or Fort Kochi.

Current Use and Public Access

Fort Frederick remains an active military installation under the Sri Lanka Army. However, it is also a functioning public site due to the location of the Koneswaram Hindu Temple within its premises, attracting thousands of pilgrims, especially during the annual temple festival. This co-existence of military function and civilian religious activity is rare and creates a semi-open space where security and accessibility are delicately balanced.

Observations noted informal tourism infrastructure, such as roadside vendors, tuk-tuk guides, and signboards in Sinhala, Tamil, and English. However, no official interpretive signage, guided tours, or structured heritage trails were present. The fort currently lacks designated tourist facilities such as viewing platforms, rest areas, or a heritage center.

Discussion. The existing hybrid use of the site reveals an important precedent adaptive reuse is already occurring in a limited form through public access. However, without a coherent planning framework, this usage remains underdeveloped and unorganized. There is a critical opportunity for formalizing tourism functions while retaining military oversight, creating a win-win scenario for both heritage preservation and public engagement.

Stakeholder Perspectives and Willingness

Stakeholder interviews revealed mixed attitudes toward tourism-focused adaptive reuse:

a. Military personnel expressed cautious support, noting the importance of preserving national security and controlling unauthorized access, but were open to the idea of guided heritage tours and information centers under military supervision.

b. Local tourism entrepreneurs (e.g., souvenir vendors, tuk-tuk drivers) were strongly supportive, highlighting the lack of facilities and visitor orientation as missed economic opportunities.

c. Urban development officials and architects acknowledged Fort Frederick's untapped potential and emphasized the importance of strategic planning, policy alignment, and sensitive design interventions.

d. Visitors and pilgrims appreciated the fort's ambience and expressed interest in learning more about its history, but were largely unaware of its colonial and military background.

Discussion. These insights demonstrate a broad base of support for adaptive reuse initiatives, especially when framed as a means to strengthen local identity, tourism income, and public awareness. Military concerns around security are legitimate but manageable through zoning, guided access, and interpretive controls. Stakeholder engagement is essential in shaping reuse plans that are inclusive and sustainable.

Tourism Potential and Site Limitations

Trincomalee district is already known for attractions such as Nilaveli Beach, Pigeon Island, and hot springs, but lacks a structured heritage tourism offering. Fort Frederick could serve as a central anchor for a "Trincomalee Heritage Circuit," linking colonial forts, religious sites, and marine attractions. However, several challenges exist:

a. Inadequate public transport and parking facilities.

b. Lack of basic tourist amenities (e.g., toilets, information kiosks) within the fort.

c. Ambiguity in institutional responsibilities. (between military, local government, and tourism authorities).

d. Cultural sensitivity attributable to the coexistence of a temple, a military zone, and tourism activities.

Discussion. While Fort Frederick's potential is high, realizing it requires coordinated governance and infrastructure upgrades. Public-private partnerships, perhaps under a heritage trust model or UDA facilitation, could help in overcoming resource and policy gaps. Drawing from best practices in military site reuse globally, a phased development plan could begin with pilot initiatives such as an outdoor interpretive trail without disturbing existing functions.

Alignment with Sustainable Development and National Goals

Sri Lanka's post-conflict development agenda prioritizes reconciliation, regional equity, and sustainable economic growth. Adaptive reuse of Fort Frederick aligns well with these objectives by:

a. Promoting regional development in the under-utilized Eastern Province.

b. Enhancing cultural awareness and inclusivity through heritage interpretation in a multi-ethnic context.

c. Reducing environmental impact through reuse of existing structures.

d. Generating local employment and entrepreneurship in tourism-linked services.

Discussion: As the Sri Lanka Army continues to play a role in national development, its involvement in promoting heritage tourism could reinforce a broader public image transformation from security provider to enabler of peace-time progress. An apprehended reuse initiative at Fort Frederick would not only safeguard-built heritage but also contribute meaningfully to national reconciliation, sustainable tourism, and the gross domestic product.

RECOMMENDATIONS AND CONCLUSION

Recommendations

Based on the findings and discussions, this section presents practical recommendations to guide the adaptive reuse of Fort Frederick in a manner that balances heritage conservation, military requirements, and sustainable tourism development in Trincomalee.

Establish a Collaborative Management Framework

A formal partnership between the Sri Lanka Army, the Department of Archaeology, the Urban Development Authority (UDA), and the Sri Lanka Tourism Development Authority (SLTDA) should be established. This collaborative body can:

a. Define zones within the fort for military use, public access, and heritage interpretation.

b. Set guidelines for visitor access, safety, and signage.

c. Manage phased development of tourism facilities with minimal disruption to current operations.

d. Such a governance framework ensures that heritage conservation and national security coexist without conflict.

Develop Interpretive Infrastructure and Visitor Facilities

Basic infrastructure must be developed to enhance visitor experience while preserving the site's authenticity. These include:

a. Multilingual interpretive signage and maps to explain the fort's history and architecture.

b. A small heritage interpretation center curated in collaboration with historians and architects.

c. Foot trails or heritage paths with guided tours to regulate visitor movement.

d. Amenities such as toilets, seating areas, shaded spots, and designated photo points.

The design of these elements must be context-sensitive and avoid intrusive construction.

Pilot Cultural Events and Educational Programmes

The site can be activated through periodic events that celebrate its cultural and historical significance. Potential initiatives include:

a. Heritage walks or storytelling evenings involving local historians and community elders.

b. School field trips supported by the Ministry of Education.

c. Exhibitions or cultural performances within designated open areas of the fort.

d. Army-led guided tours during non-sensitive periods to foster civilian-military trust.

These activities encourage local ownership and promote inter-community harmony.

Promote Fort Frederick as Part of a Regional Heritage Circuit

Fort Frederick should be positioned as the centrepiece of a broader heritage tourism strategy that links:

a. Maritime history and colonial architecture (e.g., Fort Ostenburg, Dutch Bay).

b. Religious and cultural landmarks (Koneswaram Temple, Lover's Leap).

c. Eco-tourism and marine sites (Pigeon Island, Nilaveli Beach).

Developing an integrated route can increase the length of tourist stay, promote inclusive growth, and enhance Trincomalee's brand as a multi-dimensional tourist destination.

Integrate Adaptive Reuse with National Development Priorities

The reuse strategy must align with national objectives such as:

a. Post-conflict regional development.

b. Preservation of multicultural heritage.

c. Sustainable tourism and green economic growth.

d. Improved civil-military collaboration in public projects.

Incorporating adaptive reuse in national planning documents and tourism policies can facilitate funding and ensure long-term viability.

CONCLUSION

Fort Frederick, a symbol of colonial legacy and post-independence military continuity, holds immense potential for adaptive reuse as a site of sustainable tourism. This study has shown that its historical architecture, current hybrid usage, and strategic location in Trincomalee make it a unique candidate for development that supports both conservation and economic revitalization.

Through site analysis and stakeholder insights, it is evident that adaptive reuse is not only feasible but already unfolding in informal ways. However, without a structured and inclusive approach, its potential remains underutilized. With careful planning, collaborative governance, and sensitive design interventions, Fort Frederick can serve as a model for transforming military heritage into a national tourism asset.

In doing so, it can contribute to Sri Lanka's goals of heritage conservation, regional development, and cultural reconciliation, positioning Trincomalee as a future logistics and tourism hub. The adaptive reuse of Fort Frederick is not merely about preserving the past it is about reimagining it for the future.

REFERENCES

Abdullah, A., 2019. Tourism development and heritage site conservation: Challenges in Southeast Asia. Journal of Heritage Management, 4(2), pp.113–128.

Bandara, C.M. and Perera, R., 2020. Cultural heritage and tourism: The case of Sri Lanka's Eastern Province. South Asian Journal of Tourism and Heritage, 13(1), pp.45–58.

Bullen, P.A. and Love, P.E.D., 2011. Adaptive reuse of heritage buildings. Structural Survey, 29(5), pp.411–421.

De Silva, L., 2021. Military sites as heritage landscapes: An adaptive reuse perspective. Journal of Urban History and Culture, 12(3), pp.215–229.

Fernando, S. and Shariff, N., 2013. Tourism in post-war Sri Lanka: Challenges and opportunities. International Journal of Business and Social Science, 4(8), pp.282–290.
Gunaratne, G. and Weerasinghe, T., 2022. Heritage tourism development in Sri Lanka: A spatial planning perspective. Sri Lanka Planning Review, 16(1), pp.33–52.

Lichfield, N., 1988. Economics of conservation. Cambridge: Cambridge University Press.
Menon, A. and Suresh, R., 2017. Reuse of historical forts: Case studies from South India. International Journal of Architecture and Planning, 5(2), pp.100–112.

Perera, A., 2020. The significance of Fort Frederick in Trincomalee: From colonial stronghold to cultural corridor. Trincomalee Heritage Journal, 6(1), pp.12–29.

Smith, M.K. and Robinson, M., 2006. Cultural tourism in a changing world: Politics, participation and (re)presentation. Clevedon: Channel View Publications.

Wijesundara, C., 2016. Sustainable tourism strategies in historic urban environments: Sri Lankan case studies. Built Environment Sri Lanka, 15(2), pp.15–25.

INTEGRATING MILITARY INFRASTRUCTURE TO FOSTER SUSTAINABLE MARINE TOURISM DEVELOPMENT IN TRINCOMALEE

Major AGDS Ganhewage SLAOC
Sri Lanka Army

ABSTRACT

This study explores the strategic potential of integrating military infrastructure in Trincomalee into emerging marine tourism sector of Sri Lanka. As Trincomalee is home to extensive naval and coastal defence installations as many of which are of these facilities could be repurposed or co-utilized for marine tourism development. The study is guided by three core objectives as to identify and evaluate existing military infrastructure relevant to tourism, to assess the perceived benefits, risks, and limitations of such integration form sustainability and security standpoints, and to provide strategic policy recommendations. Using quantitative approach involving with military personnel, tourism operators, and tourists, the study found broad support for a controlled, cooperative model of integration. Key benefits include increased tourist access to high potential coastal zones, improved infrastructure utilization, and regional economic uplift. However, concerns over national security, operational disruption, and environmental impact were also prominent. The findings underscore the need for adaptive policies that balance security imperatives with development goals. The study proposes shared use frameworks and stakeholder driven governance as essential for successful integration. This model offers a replicable framework for leveraging military assets for national development.

Keywords: Military tourism, Marine tourism, Tourism development, Infrastructure integration

INTRODUCTION

Trincomalee, situated on the Eastern coast of Sri Lanka, is globally recognized for its natural deep water harbor, strategic maritime location, rich marine biodiversity, and historical heritage. Traditionally, the region has served as a vital military zone due to its geopolitical value in the Bay of Bengal and its proximity to regional sea lanes in the Indo Pacific. Post conflict developments in Sri Lanka, coupled with increasing interest in regional connectivity, have

opened new discussions on the dual use of military infrastructure for civilian economic development, particularly in sectors like logistics and tourism.

Marine tourism, encompassing eco-tourism, recreational boating, diving, whale watching, and coastal heritage exploration, is a rapidly growing segment globally. Eastern province of Sri Lanka, especially Trincomalee, hold untapped potential for this niche sector. However, despite the natural and cultural advantages, the area remains underutilized in the tourism economy. A large part of this is due to limited access to infrastructure which is currently owned, operated, or restricted by military institutions for national security purposes. Paradoxically, this same infrastructure secure ports, air strips, logistics networks, and coastal monitoring capabilities could provide the foundation for a thriving and sustainable marine tourism sector if integrated responsibly.

Government and institutional policy frameworks have recognized the potential of Trincomalee as a maritime and logistics hub. However, the integration of military assets into broader civilian economic activities such as tourism has received limited attention in practical planning and academic literature. Further, existing literature like Fonseka and Raheem (2009) and Jayawardena (2020) focus on either the strategic military significance of Trincomalee or its logistical and economic development potential. Few studies have explored how military infrastructure can directly support maritime tourism. Most importantly, no significant quantitative research has examined stakeholder perceptions, feasibility, or socio-economic impacts of such integration in the Sri Lankan context. This gap prevents policy makers from making evidence-based decisions regarding infrastructure sharing, civilian military cooperation, and sustainable coastal development.

This study aims to evaluate the feasibility and potential impact of integrating military infrastructure in Trincomalee to foster sustainable marine tourism development through a quantitative assessment of stakeholder perspectives. Further, the research is guided by objectives as to identify and evaluate existing military infrastructure in Trincomalee that could support marine tourism initiatives, to determine the perceived benefits, risks, and limitations of such integration from a sustainability and security standpoint, and to provide strategic recommendations for policy for marine tourism development. However, the research acknowledges several limitations as the access to certain infrastructural and operational data may be restricted, responses of stake holder may be bias based on institutional loyalty, economic interest, or security concerns. Moreover, this study is significant for several reasons as

it contributes to filling a critical empirical gap in tourism and infrastructure planning literature by exploring the under researched interface between military and tourism sectors. Lastly, the findings can serve as a blueprint for similar dual use infrastructure models in other strategic coastal locations within the Indo-Pacific region.

METHODOLOGY AND EXPERIMENTAL DESIGN

This study adopts a quantitative research approach to systematically evaluate the potential integration of military infrastructure in Trincomalee into sustainable marine tourism. Quantitative methods are suitable for measuring stakeholder perceptions, infrastructure potential, and the strategic alignment of military assets with tourism objectives. The research is structured to identify key variables such as infrastructures usability, perceived risks and benefits, and stakeholder readiness and assess their relationships through statistical analysis.

A descriptive cross sectional survey design was employed to gather data from a diverse pool of stakeholders within Trincomalee District. The design facilities the collection of data at a single point in time to capture the current perceptions, attitudes, and awareness levels regarding the integration of military infrastructure into marine tourism. The study combines elements of exploratory and evaluate research to generate both diagnostic insights and policy relevant findings. The study population includes four primary groups as military personnel, local tourism operators, and tourists. A stratified random sampling technique was used to ensure representation across all stakeholder categories. From a calculated sampling frame of approximately 400 individuals across these strata, a total sample size of 150 respondents was selected using a proportional allocating method. The sample size was determined using Krejcie and Morgan's formula (1970), allowing for 95% confidence level and + 5% margin of error.

Primary data was collected through a structured self-administrated questionnaire. The instrument was divided into four sections as demographics, infrastructure evaluation, perceived benefits and risks, and strategic recommendations. The questionnaire was pre tested with pilot group of 10 individuals from each stakeholder category to validate clarity, relevance, and reliability. Minor modifications were made based on feedback. Data collected were coded and analysed using Statistical Package for the Social Sciences (SPSS). The analysis was performed in three stages as descriptive statistics,

inferential statistics, and mean comparison tests. Findings are interpreted in relation to the three research objectives. Variables such as 'perceived risks', 'infrastructure readiness', and 'policy recommendation support' were treated as depended variables, while stakeholder group, occupation, and experience in the tourism sector served as independent variables.

All ethical guidelines are strictly adhered by obtaining informed consent from all participants. Respondent confidentially and anonymity are assured, and participation is voluntary with right to withdraw at any stage. Further, the study focuses exclusively on Trincomalee District, and the findings are applicable primarily within this geographic and sociopolitical context. The research emphasizes marine tourism and existing military infrastructure, without exploring new infrastructure development or other tourism forms. As a cross-sectional study, the results reflect perceptions and conditions during the time of data collection and may evolve with future policy changes.

RESULTS

This section presents the analysed findings from the 120 valid responses obtained through the structured questionnaire distributed among key stakeholders in Trincomalee. The data is organized in alignment with the three research objectives.

Profile Respondents

A total of 150 respondents participated representing military personnel, tourism service providers, government officials, and tourists. The table 1 illustrates the respondent profile by stakeholder group.

Table 1: Descriptive Statistics of Main Variables

Stakeholder Group	Frequency	Percentage (%)
Military personnel	45	30.0
Tourism operators	37	24.7
Tourists	38	25.3

Source: The Author Developed Based on Statistical Package for the Social Sciences

Evaluation of Existing Military Infrastructure

Respondents were asked to rate the suitability of various military infrastructure assets in Trincomalee for marine tourism on a 5 point Likert scale (1= Not suitable, 5 = Highly suitable). Assets evaluated included naval piers, transport facilities, surveillance zones, and restricted beaches. Figure 1 illustrates the perceived suitability of military infrastructure for marine tourism.

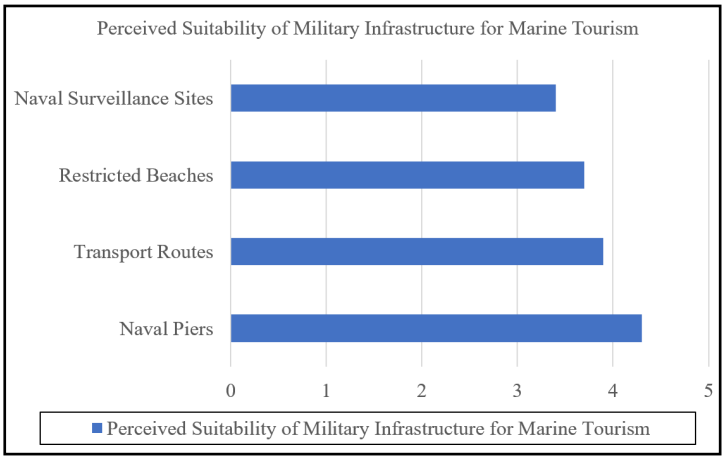

Figure 1: Perceived Suitability of Military Infrastructure for Marine Tourism
Source: The Author Developed Based on Statistical Package for the Social Sciences

Naval piers are considered the most suitable (mean = 4.3), followed by military transport routes (mean = 3.9), community respondents emphasized underused beach access area currently restricted to civilians.

Perceived Benefits of Integration

Respondents were presented with a list of potential benefits of military tourism integration and asked to indicate their level of agreement. Table 2 illustrates that the perceived benefits of integrating military infrastructure.

Table 2: Perceived Benefits of Integrating Military Infrastructure

Benefits	Mean	Std. Dev.
Economic development through tourism	4.5	0.67
Improved civil military coordination	4.1	0.82
Increased regional security	3.9	0.76
Efficient use of underutilized assets	4.2	0.70

Source: The Author Developed Based on Statistical Package for the Social Sciences

Overall, economic development (mean = 4.5) and efficient use of military assets (mean = 4.2) were strongly supported, particularly by tourism operators and local residents.

Perceived Risks and Limitations

Respondents were also asked to indicate perceived risks or barriers to military tourism integration. Further, the figure 2 illustrates that the key perceived risks.

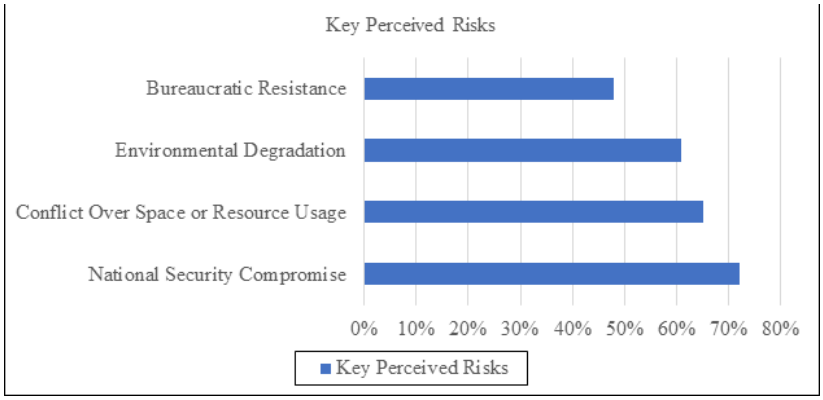

Figure 2: The Key Perceived Risks
Source: The Author Developed Based on Statistical Package for the Social Sciences

Security compromise was the most cited concern (72%), especially among military respondents. Civilian stakeholders emphasized potential environmental degradation and resource use conflicts.

Support for Strategic Recommendations

Stakeholders were asked whether they supported strategic measures such as joint management models, military led eco tours, and designated shared use zones. Further, the table 3 illustrates the support for policy recommendations.

Table 3: The Support for Policy Recommendations

Strategic Recommendation	Support Level
Military led marine heritage tours	81%
Designated shared use coastal zones	76%
Civil military joint tourism committees	68%
Seasonal or limited civilian access zones	59%

Source: The Author Developed Based on Statistical Package for the Social Sciences

There was robust support (over 75%) for military managed heritage tours and joint zones, especially among community members and tourism stakeholders.

Stakeholder Differences

Significant statistical differences emerge bet ween groups. For instance, military personnel prioritized security concerns, while local tourist operators strongly favored assets reallocation. An ANOVA test confirmed significant differences in support for marine tourism expansion between military and civilian stakeholders ($p<0.5$).

Consequently, military infrastructure in Trincomalee, particularly naval piers and coastal access points, are considered highly suitable for tourism integration. Further, economic development and efficient resource utilization were the most widely acknowledged benefits. Moreover, key perceived risks included potential national security breaches and environmental degradation. Finally, most stakeholders supported the concept of shared use models contingent on adequate regulatory frameworks.

DISCUSSION

The results of the study reveal significant insights into the potential of integrating military infrastructure into marine tourism of Trincomalee. The findings align with global trends where defence installations are repurposed or shared with civilian industries to foster economic development, especially in post conflict region. This section critically interprets the findings in relation to the research objectives and existing scholarly discourse, examining both the opportunities and the challenges from sustainability and security perspectives

Potentiality of Military Infrastructure to Support Marine Tourism

The first objective revealed that naval piers, restricted beaches, and military controlled transport routes are viewed as highly suitable for tourism development. The highly suitability scores for naval piers and transport routes reflect stakeholder confidence in repurposing these facilities without extensive capital investment. These finding are consistent with studies of Prideaux (2021) in post military economies such as in Croatia and Malta, where former naval assets were transformed into civilian marines and cruise ports. The military controlled zone of Trincomalee, including Fort Fredrick and Dockyard naval facilities, already possess historical, scenic, and strategic value. These areas

are currently underutilized due to access restrictions and security zoning. If appropriately managed, these assets can bridge the gap between national security preservation and coastal tourism development, fulfilling the dual purpose of defence and economic uplift

Perceived Benefits, Risks and Limitations

The second objective involved determining perceived benefits, risks, and limitations of military tourism integration. Stakeholders overwhelmingly acknowledged economic development and better utilization of underused infrastructure as major benefits. These align with national economic diversification goals and reflect the local demand for inclusive tourism models. However, perceived risks, especially the potential compromise of national security and conflicts over land and resource allocation and, highest complex trade-offs. Military stakeholders were particularly cautious, fearing that unrestricted civilian access might dilute operational security and surveillance control. According to Rogers et al (2018), these concerns are echoed in security studies literature, which warns against civilian encroachment on high value military zones without adequate buffer regulation. Environmental concerns also emerged as a limitation. Many coastal zones under military protection have remained ecologically preserved due to limited civilian interference. Opening them up to unregulated tourism could lead to coral reef damage, waste disposal issues, and marine life disruption. There froe, the integration strategy must adopt environmentally sustainable models, such as low impact echo tour of guided marine heritage experiences.

Feasibility of Strategic Policy Recommendations

In response to the third objective, respondents express strong support for military led marine heritage tours and designated shared use coastal zones. These preferences indicate that the community is open to military civilian collaboration, as long as regulatory clarity and boundary conditions are established. This model of dual use or shared governance aligns with concepts of Samarajiva (2017) as ‘adoptive reuse’ in coastal defence planning, where non sensitive areas are gradually repurposed with policy level support. Civil military joint committees, supported by 68% of respondents, could ensure cross sector dialogue, resolve conflicts and enforce guidelines for tourism conduct near sensitive zones. Further, seasonal access controls or rotational usage policies could balance tourism influx with operational military needs. This model has been successful in countries like Japan, where military islands

are opened to the public during off peak training cycles, promoting cultural tourism without disrupting readiness.

Divergences between Stakeholder Groups

The ANOVA test results demonstrated statistically significant differences between stakeholder groups. Military respondents prioritized security, while tourism providers and local residents emphasized economic opportunity. These differences reflect differing institutional priorities and risk perceptions. Bridging this gap requires inclusive policymaking, where each stakeholder's concerns are institutionally acknowledged and strategically managed through inter agency mechanisms.

The integration of military infrastructure into marine tourism in Trincomalee presents a promising opportunity, but it is not without risks. Security, environmental sustainability, and civil military coordination are key policy frameworks, Whereas, stakeholder engagement, military infrastructure can significantly contribute to blue economy of Sri Lanka, transforming Trincomalee into a leading marine tourism hub.

CONCLUSION

This study critically examined the feasibility of integrating existing military infrastructure in Trincomalee into the region's marine tourism development framework. The findings reveal a substantial opportunity to repurpose or share military assets such as naval piers, transport networks, and historically significant sites for tourism use. These underutilized facilities possess high economic and cultural potential, which, if tapped strategically, can contribute meaningfully to blue economy of Sri Lanka and post conflict regional development.

The research identified clear benefits, including economic revitalization, enhanced infrastructure use, and tourism diversification. At the same time, it recognized significant risks, particularly related to national security, environmental degradation, and stakeholder conflict over land use. Stakeholder analysis underscored contrasting perspectives as the military officials emphasized security and operational integrity, while tourism stakeholders and local communities highlighted economic opportunity and inclusivity.

Despite these divergent views, the majority of respondents supported a balanced, regulated integration model. Strategic policy recommendations emerging from this study include the adoption of shared use zoning, the formation of civil military tourism committees, and environmentally sustainable tourism practices within heritage tours could provide viable compromise solutions.

The study concluded that military infrastructure, if properly governed and strategically integrated, holds strong potential to elevate the tourism profile of the region. It calls for inclusive and adoptive policymaking that respects national security interests while promoting socio economic development. The long-term success of this integration hinges on transparent stakeholder engagement, environmental safeguards, and inter agency coordination. Ultimately, a collaborative civil military approach can transform Trincomalee into a flagship model for marine tourism, contributing to both national security resilience and sustainable economic growth.

REFERENCES

Fonseka, B. and Raheem, M. (2009) Trincomalee High Security Zone and Special Economic Zone. Colombo: Centre for Policy Alternatives. Available at: https://cpalanka.org/wp-content/uploads/2009/11/Trincomalee%20High%20Security%20Zone%20and%20Special%20Economic%20Zone.pdf (Accessed: 7 July 2025).

Jayawardena, W.R.D., 2020. Civil Military Relations: A Case Study of Sri Lanka. MSc in Security & Strategic Studies dissertation, General Sir John Kotelawala Defence University, Colombo. Available at: http://ir.kdu.ac.lk/handle/345/4301 (Accessed: 11 July 2025).

Krejcie, R.V. and Morgan, D.W., 1970. Determining sample size for research activities. Educational and Psychological Measurement, 30(3), pp.607–610. https://doi.org/10.1177/001316447003000308
Prideaux, N. et al., 2021. Towards a Clinical Decision Making Algorithm Guiding Locomotor Therapy Modality in Subacute Stroke: An Exploratory Study. Stroke, published online ahead of print. https://doi.org/10.1016/j.jstrokecerebrovasdis.2021.106112 (Accessed: 23 July 2025).

Rogers, M.B., McConnell, B.M., Hodgson, T.J., Kay, M.G., King, R.E., Parlier, G.H. and Thoney-Barletta, K. (2018) 'A Military Logistics Network Planning System', Military Operations Research, 23(4), pp. 5–24. Available at: https://www.researchgate.net/publication/330204842_A_Military_ Logistics_Network_Planning_System (Accessed: 6 July 2025).

Samarajiva, R. (2017) 'Pre-conditions for the success of Trincomalee as a transport and logistics hub serving the Bay of Bengal', in Trincomalee Consultations: Regional Cooperation for Economic Prosperity and Maritime Security in the Bay of Bengal, pp. 60–71. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3667435 (Accessed: 12 July 2025)

FROM GARRISON TO GREEN TOURISM: UNLOCKING MILITARY ECO-TOURISM POTENTIAL IN TRINCOMALEE

Major MACC Malawara Arachchi SLEME
Sri Lanka Army

ABSTRACT

This study investigates the strategic opportunities and operational challenges associated with transforming military establishments in Trincomalee into eco-tourism destinations. Trincomalee, a historically significant coastal district with a strong military presence and rich natural heritage, offers untapped potential for military eco-tourism that can simultaneously promote sustainable development and national heritage preservation. Adopting a quantitative research design, data is collected from 217 respondents representing tourism professionals, military personnel, and local community. The Statistical Package for the Social Sciences (SPSS) analysis revealed moderate to high public awareness and support for military eco tourist initiatives, particularly those involving sites like Fort Fredrick, Marble Beach, and SLN Dockyard. The findings father revealed moderate concern over institutional readiness and security implications, suggesting that public acceptance is contingent upon clear policy frameworks and inter agency coordination. Weak correlations among the variables highlight that support is primarily driven by environmental and cultural value rather than economic or security considerations. The study concludes that a structured, multi stakeholder approach is essential for successful implementation. If properly managed, Trincomalee can become a model for integrating military heritage and environmental stewardship into a viable, sustainable tourism strategy.

Keywords: Military eco tourism, Sustainable tourism, Defence heritage, Public

INTRODUCTION

Sri Lanka, an island nation with abundant biodiversity and cultural heritage, is increasingly turning to sustainable tourism as a vehicle for economic growth and environmental preservation. Among its most strategic yet underutilized assets is Trincomalee, located on the Eastern coast where rich ecological zones coexist with high security military lands. Trincomalee hosts coral reefs, wildlife

habitats, ancient temples, and colonial forts, many of which are situated within or adjacent to military controlled zones. With the decline in conflict related military activities post war, there is a growing interest in repurposing selected military lands for eco-tourism by blending environmental sustainability with national development.

Military eco-tourism, which Hewawasam (2024) defines as ecologically, responsible tourism ventures operated or overseen by military institutions, has been successfully adopted in countries such as India and Israel. These models offer dual benefits as protecting sensitive areas through military discipline and infrastructure while facilitating controlled public access to promote tourism and local livelihoods. In Sri Lanka, however, Asian Development Bank (2021) claims that this concept remains in its infancy, particularly in Trincomalee where the military controls extensive coastal, forest, and heritage rich areas that are currently inaccessible or underdeveloped for tourism. Despite the potential, there are strategic and operational challenges. Fonseka and Raheem (2009) highlight that the security concerns, institutional mandates, absence of formal policies, limited inter agency coordination, and concerns about environmental impact hinder the transformation of military zones into sustainable tourism assets. Stakeholders including tourism professionals, environmentalists, military personnel, and local communities hold divergent views on the feasibility and appropriateness of such initiatives.

The existing literature like Nandy and Naha (2023) identify a gap in systematic, empirical studies exploring how military controlled spaces in Sri Lanka, especially in Trincomalee, can be integrated into eco-tourism frameworks without compromising security or ecological integrity. Most prior research like Jayawardena et al (2020) have focused on nature based tourism or heritage tourism in civilian areas, ignoring the strategic overlay and opportunities presented by military stewardship. This study attempts to address this gap by investigating the perceived benefits, risks, and challenges of initiating military led eco-tourism in Trincomalee.

The aim of the research is to assess the strategic opportunities and operational challenges of initiating military eco-tourism in Trincomalee for sustainable regional development. The research is guided by three objectives as to identify the level of stakeholder awareness and support for military led eco-tourism in Trincomalee, evaluate the perceived economic, environmental, and social benefits of converting military controlled area into eco-tourism zones, and examine the operational, policy, and security related challenges associated with implementing military eco-tourism in Tincomalee.

METHODOLOGY AND EXPERIMENTAL DESIGN

This study adopts a quantitative research methodology to investigate the viability of military eco-tourism in Trincomalee by capturing structured feedback from key stakeholder groups. The design is deductive and relies on numerical data to test assumptions about stakeholder perceptions, benefits and challenges.

The research uses a cross sectional survey design to gather data from diverse stakeholders, including tourism professionals, military personnel, and community members. The study area covers military influenced zones in Trincomalee, such as Fort Fredrick, Marble Beach, and the surrounding coastal and forested areas. A structured questionnaire was developed on literature reviews and expert input. It includes closed ended questions using a five point Likert Scale. This questionnaire is divided into four sections as demographic data, awareness and support for military eco-tourism, perceived benefits, and perceived challenges. The targeted population includes stakeholders within Trincomalee District. Using Krejcie and Morgan's table for sample size determination, and assuming a population of approximately 500 relevant individuals, the required sample size is 217 respondents. A stratified random sampling technique is used to ensure representation from each stakeholder category.

Primary data was collected over a period of four weeks using physical and online distribution of questionnaires. Responses were collected anonymously to ensure honesty and minimize bias. Secondary data was gathered from reports by the Sri Lanka Tourism Development Authority (SLTDA) and published research on eco-truism. Quantitative data are analysed using SPSS software. Descriptive statistics are used to summarise general trends. Inferential statistics, including correlation and regression analysis, are applied to examine relationships between stakeholder support and perceived benefits or challenges. A reliable test was performed to confirm internal consistency of the scale.

The research adhered to ethical standards by obtaining verbal consent from participants, ensuring confidentiality, and maintaining the anonymity of responses. Ethical clearance was obtained from the relevant academic and local authorities prior to data collection. While the study provides a robust quantitative analysis, its generalizability is limited to the Trincomalee context. The exclusion of qualitative insights may limit the understanding of complex stakeholder attitudes, which will be addressed in future mixed method studies.

RESULTS

The quantitative analysis of 217 respondents provides insight into public perception, support, and operational concerns related to military eco-tourism initiatives in Trincomalee. The study used a five point Likert Scale to evaluate variables such as awareness, support, perceived benefits, and challenges associated with integrating eco-tourism with military infrastructure in the region.

Descriptive Statistics

The awareness of military eco-tourism scored a relatively high mean of 3.93, suggesting that the concepts is well known among respondents. Similarly, the mean score for support toward military eco-tourism is 3.54, indicating a generally favourable attitude among the sample population. Perceived economic benefits yielded a moderate mean score of 2.99 reflecting a divided opinion on whether military eco-tourism will significantly contribute to local economic development. On the other hand, perceived environmental benefits were rated higher, with a mean of 3.58, suggesting that the integration of eco-tourism with military facilities is widely seen as environmentally beneficial. Further, perceived security challenges registered a lower mean 2.91, indicating that while security concerns are acknowledged, they are not considered a dominant barrier. Meanwhile, policy and operational barriers scored 3.49, reflecting moderate concern about institutional or bureaucratic constraints that could hinder eco-tourism projects. The table 1 illustrates the descriptive statistics of key variables.

Table 1: The Rate of Current Tri Forces Support System as of the Experts Evaluation

Variable	N	Mean	Std. Deviation
Aware of Military Eco Tourism	217	3.93	0.81
Support for Military Eco Tourism	217	3.54	1.06
Perceived Economic Benefits	217	2.99	1.42
Perceived Environmental Benefits	217	3.58	1.12

Source: Author Developed Based on Results of the Statistical Package for the Social Sciences

Correlation Analysis

The correlation matrix in table 2 indicates minimal to weak relationships between the key variables. Support for military eco-tourism is slightly and positively correlated with perceived economic benefits and policy barriers, suggesting that support does not strongly depend on economic or institutional perceptions. Interestingly, environmental benefits perceptions show a slight negative correlation with support, possibly indicating that support is more grounded in social or cultural acceptance rather than environmental narratives alone. Similarly, the correlation between security challenges and support as weak and negative, suggesting that perceived threats do not significantly discourage public support. These low correlation values imply that the support for military eco-tourism in Trincomalee is not solely driven by individual variables such as economic gins or security concerns, but rather a complex mix of awareness, trust in military institutions, and expectations of sustainability.

Table 2: The Pearson Correlation Matrix

Variable	SET	EB	EVB	SC	PB	A
Support for Eco Tourism (SET)	1.00					
Economic Benefits (EB)	0.06	1.00				
Environmental Benefits (EVB)	-0.03	0.21	1.00			
Security Challenges (SC)	-0.03	0.11	0.18	1.00		
Policy Barriers (PB)	0.02	0.19	0.15	0.31	1.00	
Awareness (A)	0.18	0.10	0.09	-0.04	0.13	1.00

Source: Author Developed Based on Results of the Statistical Package for the Social Sciences

Reliability Analysis

A reliability test was conducted on the fire core constructs as support for military eco-tourism, perceived economic and environmental benefits, perceived security challenges, and policy barriers. The resulting Cronbach's alpha value was 0.66 indicating moderate internal consistency among the items. While this value falls below the widely accepted 0.70 threshold for strong reliability, it is acceptable for exploratory research of this nature, particularly when dealing with multidimensional constructs in social sciences. The table 3 illustrates the reliability statistics.

Table 3: Reliability Statistics

Scale	Number of Items	Cronbach's Alpha	Interpretation
Combined scale	5	0.66	Moderate reliability

Source: Author Developed Based on Results of the Statistical Package for the Social Sciences

In conclusion, high awareness and moderate support suggest a public readiness for pilot eco-tourism projects involving military spaces, and environmental benefits are recognized more clearly than economic benefits, highlighting the need to better communicate the potential economic impacts while security concern are present but not pronounced, offering room for risk managed public access strategies. Further, institutional and policy related barriers are perceived to exist, signaling a need for streamlined inter agency collaboration and legal clarity. Moreover, weak inter variable correlations highlight that perceptions and support vary independently across individuals, emphasizing the need for localized stakeholder engagement.

Overall, the results suggest a favourable outlook for developing military eco-tourism in Trincomalee, but also underline the need for strategic planning, stakeholder construction, and regulatory support to ensure sustainable and secure implementation.

DISCUSSION

The findings of this study offer critical insights into the prospects and operational considerations of military eco-tourism in Trincomalee. The results revealed a generally favorable public orientation toward the concept, with high awareness (M = 3.93, SD = 0.81) and moderate support (M = 3.54, SD = 1.06) among respondents. This indicates a strong foundational readiness for stakeholder engagement in transforming military spaces into eco-tourism sites, especially in historically and environmentally rich regions like Fort Fredrick, Marble Beach, and SLN Dockyard. The moderate level of perceived environmental benefits (M = 3.58, SD = 1.12) suggests that the public recognizes the ecological potential of military lands of Trincomalee if converted responsibly for tourism. However, the perceived economic benefits (M = 2.99, SD = 1.42) remains neutral, indicating skepticism or uncertainty regarding the tangible financial gains from such initiatives. This highlights the need for clearer economic models that show how military led eco-tourism

ventures can contribute in local employment, revenue sharing, and regional development. It is possible that the public lacks sufficient exposure to existing successful models such as the adoptive reuse of British garrisons in countries like India or Vietnam.

Interestingly, the correlation analysis revealed only weak relationships between most variable ($r < 0.3$), signifying that support for eco-tourism is not linearly determined by any single factor. The weak positive correlation between support for eco-tourism and perceived economic benefits ($r = 0.66$) indicates that support may be driven by intrinsic motivations such as cultural pride or environmental values rather than purely economic incentives. Similarly, the slightly negative correlation between support and perceived security concerns ($r = -0.03$) indicates that security fears do not decisively deter support, reinforcing the idea that the population is open to exploring well-regulated and professionally managed forms of military tourism.

The Cronbach's alpha value of 0.66 for the combined scales reflects moderate internal consistency, which is acceptable in exploratory social research. This suggests that the items used to evaluate attitudes toward military eco-tourism form a coherent scale, through future studies may consider referring the questionnaire to improve reliability. From an operational stand point, the public's moderate support and identified concern call for a balanced policy framework. Military installations like Fort Fredrick can be partially demilitarized and developed under dual use models, integrating environmental education, heritage preservation, and eco recreation while retaining operational readiness. Initiatives should include visitor management protocols, civil military collaborating mechanisms, and sustainable infrastructure development.

In terms of governance, the perceived institutional barriers highlight a need for inter-agency coordination between the MOD and SLTDA. The development of pilot projects in controlled zones could help build trust and generate empirical evidence on safety, revenue potential, and environmental impact. Further, targeted community engagement and awareness campaigns may mitigate misperceptions and promote ownership among local populations, particularly youth and war affected communities.

Overall, the study demonstrates that Trincomalee holds significant but underutilized potential for military eco-tourism, and public sentiment while cautious is largely optimistic. Further, planning must adopt a participatory, transparent, and adaptive approach to convert these findings into action,

ensuring that both national security and environmental stewardship remain uncompromised.

CONCLUSION

This study explored the strategic potential and operational challenges of developing military eco-tourism in Trincomalee, with a specific focus on public perceptions, environmental prospects, and institutional readiness. The findings revealed a moderately high level of public awareness and support for converting selected military sites into eco-tourism attractions such as Fort Fredrick, Marble Beach, and SLN Dockyard. Respondents acknowledge the environmental and heritage value of these locations and express cautious optimism about their integration into the broader tourism sector.

However, several operational and strategic barriers were also identified. Key among them were perceived institutional and policy limitations, moderate concerns over national security, and uncertainty about the economic benefits such transformations would bring to local communities. These insights emphasize that while the concept of military eco-tourism is broadly accepted by the public, successful implementation requires a carefully calibrated approach that balances tourism, environmental preservation, and defence priorities.

The weak correlation between support for eco-tourism and variables such as perceived economic gin and security concerns suggest that public backing is influenced more by heritage value and environmental consequences than financial or risk based considerations alone. This is an encouraging signal for policy makers seeking to promote low impact, value driven tourism development.

To move from concept to practice, it is essential to pilot military eco-tourism initiatives in semi operational or decommissions zones within Trincomalee. A structured framework by covering inter agency collaboration, community consultation, security protocols, and sustainability planning is critical to success. By transforming military garrisons into green tourism assets, Trincomalee can lead Sri Lanka in developing a unique tourism niche that combines history, ecology, and national pride, paving the way for regional development, post conflict reconciliation, and strategic land use innovation.

REFERENCES

Abeyrathna, G.R.T.B. (2024) 'Navigating the future: innovations and sustainability in supply chain management – introducing a warehouse to Trincomalee Harbour', Research Symposium on Supply Chain Management & Logistics, Colombo, 28 February. Colombo: National Institute of Business Management, pp. 1–?. Available at: https://www.researchgate.net/publication/378525157_Navigating_the_Future_Innovations_and_Sustainability_in_Supply_Chain_Management_Introducing_a_Warehouse_to_Trincomalee_Harbour (Accessed: 7 July 2025).

Asian Development Bank (2021) National Port Master Plan: Technical Assistance Completion Report. Project Number 50184-001. Manila: Asian Development Bank. Available at: https://www.adb.org/sites/default/files/project-documents/50184/50184-001-tacr-en_17.pdf (Accessed: 6 July 2025).

Finnigan, C. (2019) 'South Asia's logistical hub: Challenges and opportunities for Sri Lanka's transshipment future', South Asia @ LSE, 21 June. Available at: https://blogs.lse.ac.uk / southasia/2019/06/21/south-asias-logistics-hub-challenges-and-opportunities-for-sri-lankas-transshipment-future/ (Accessed: 9 July 2025).

Fonseka, B. and Raheem, M. (2009) Trincomalee High Security Zone and Special Economic Zone. Colombo: Centre for Policy Alternatives. Available at: https://cpalanka.org/wp-content/uploads/2009/11/Trincomalee%20High%20Security%20Zone%20and%20Special%20Economic%20Zone.pdf (Accessed: 7 July 2025).

Hewawasam, P. (2024) Sri Lanka's Logistics and Maritime Transport Sector amidst the Polycrisis. UNCTAD Multi-year Expert Meeting on Transport, Trade Logistics and Trade Facilitation, 11th Session, 23–24 October. Geneva: UNCTAD. Available at: https://unctad.org/system/files/non-official-document/cimem7-2024-c03srilanka_en.pdf (Accessed: 14 July 2025).

Jayawardena, W.R.D., 2020. Civil Military Relations: A Case Study of Sri Lanka. MSc in Security & Strategic Studies dissertation, General Sir John Kotelawala Defence University, Colombo. Available at: http://ir.kdu.ac.lk/handle/345/4301 (Accessed: 20 July 2025).

Institute of National Security Studies Sri Lanka (INSSSL) (2021) Defence Review 2020, Volume III. Colombo: INSSSL. Available at: https://www.inss.lk/assets/images/publication/other/images /2021/january/2021_01_27/Defence_Review_compressed.pdf (Accessed: 20 July 2025).

Nandy, D. and Naha, A. (2023) 'Strategic significance of Sri Lanka in India's Indian Ocean approach', Indian Studies Review, 3(2), pp. 63–82. Available at: https://www.researchgate.net/publication/381843623_Strategic_Significance_of_Sri_Lanka_in_India%27s_Indian_Ocean_Approach_Indian_Studies_Review_3_2_2023_pp_63-82 (Accessed: 5 July 2025).

SECURING HERITAGE: INTEGRATING MILITARY HISTORY AND COASTAL ECOLOGY TO PROMOTE SECURITY TOURISM IN EASTERN SRI LANKA

Major HMAK Wijesinghe VIR
Sri Lanka Army

ABSTRACT

This study explores the feasibility of integrating military history and coastal ecology to promote a sustainable security tourism model in Trincomalee, Eastern Sri Lanka. The region is endowed with rich military heritage such as Fort Fredrick and strategic naval installations as well as ecologically sensitive zones including coral reefs and mangrove ecosystems. However, these assets remain underutilized due to institutional silos, limited infrastructure, and security related restrictions. Using a quantitative approach, data were collected from 150 participants, including local residents, tourists, military personnel, and tourism professionals. The results revealed strong public interest and awareness regarding integrated tourism, along with perceived benefits in national education, economic uplift, and environmental conservation. Yet, challenges such as security risks, environmental concerns, and policy fragmentation were identified. Statistical analysis confirmed significant perception differences among stakeholder groups and highlighted three core factors influencing feasibility as perceived benefits, risk management, and institutional reediness. The study recommends a structured, risk managed, and policy aligned approach to transform Trincomalee into a security tourism destination. Findings offer actionable insights for the Ministry of Defence, Sri Lanka Tourism Development Authority aiming to balance national identity, ecological sustainability, and regional development through tourism innovation.

Keywords: Security tourism, Military heritage, Coastal ecology, Trincomalee development

INTRODUCTION

Sri Lanka's astern Province, particularly Trincomalee, is a treasure trove of military history and ecological richness. The convergence of colonial forts, naval bases, and untouched coastal ecosystems creates a unique platform for promoting security tourism- a form of heritage tourism that leverages military and security-related sites for educational and recreational purposes. A Amid

growing efforts to revitalize the regional economy through sustainable tourism, integrating military heritage with environmental conservation presents an untapped opportunity to attract both domestic and international tourists.

Globally military tourism has been recognized for its potential to preserve historical legacies while contributing to regional economic development. Simultaneously, costal economy-based tourism supports biodiversity conservation and promotes sustainable loverhoods. However, Sri Lanka has yet to fully leverage this duel potential in a harmonized framework. The fortifications of Fort Fedrick, the strategic naval installations in Trincomalee, and the adjacent marine ecosystems such as coral reefs and mangrove forests remain underutilized in national tourism policy and planning. These sites carry immense value not only in terms of historical significance but also in educating the public about national security and environmental resilience.

Sri Lanka Export Development Board (2018) explains that although the government has invested in logistics and maritime infrastructure efforts have predominantly focus on commercial and naval operations rather than tourism. Moreover, as highlighted by Jayawardana (2020) and Fonseka and Raheem (2009), public access to higher security zones and military linked heritage sites has been constrained due to the security protocol and lack of tourism planning. These gaps point to the need for a balanced an inclusive model that integrates security tourism and ecological conservation while ensuring compliance with national security standards.

The research gap lies in the absence of a structed, evidence-based framework that evaluates public perception, infrastructure readiness, and the feasibility of integrating military and ecological assets into the regional tourism in isolation, ignoring the synergies and challenges associated with combining both under the umbrella of security tourism. The aim of this study is to evaluate the feasibility and public receptiveness of integrating military history and costal ecology into a security tourism model in Eastern Sri Lanka, with a focus on Trincomalee District.

The research is guided by four objectives as to assess public awareness and interest in military heritage and costal ecological tourism in Trincomalee, to evaluate infrastructure and policy readiness for implementing integrated security tourism, to analyze stakeholder perspectives (military personnel, local communities, environmentalists, and tourism officials) on potential

opportunities and constraints, to recommend strategic actions for harmonizing security, conservation, and tourism in Eastern Sri Lanka.

By combining insights from military studies, tourism management, and environmental planning, this research contributes to a growing body of literature of sustainable regional development and national security awareness. It is expected that findings will inform policy revisions and encourage collaboration among the Ministry of Defence (MOD), Sri Lanka Tourism Development Authority (SLTDA), and environmental stakeholders.

METHODOLOGY AND EXPERIMENTAL DESIGN

This study employs a quantitative research approach to systematically evaluate the feasibility and stakeholder perceptions of integrating military history and coastal ecology into unified security tourism in Trincomalee, eastern Sri Lanka. A deductive methodology is used, grounded in existing theories of heritage tourism, security planning, and environmental conservation. The research adopts a cross-sectional survey design to collect primary data from diverse group of respondents within the Trincomalee District. Theis includes local residents, domestic and foreign tourists, military personnel, and stakeholders from the tourism and environmental sectors. The choice of a cross-sectional design ensures a snapshot view of current perceptions and readiness levels, offering generalizable insights for short to medium-term policy interventions.

a. **Sampling Method and Sampling Size.** Astratified random sampling technique is used to ensure proportional representation of the four respondents' groups as local residents (30%), tourists (25%), military/security personnel (25%), and tourism and environmental officers (20%). A sample size of 150 participants has been selected, based on the Krejcie and Morgan's (1970) sample size table for a population exceeding 10,000. This ensures adequate statistical power for inferential analysis.

b. **Data Collection Tool.** A structured questionnaire comprising 25 closed ended questions on a 5 points Likert scale is employed to capture perceptions on key dimensions, including as awareness of military heritage and coastal economy, interest in participating in security tourism, perceived economic and security benefits, concerns regarding access and environmental impact, and infrastructure availability and policy support. The questionnaire is

validated through expert review and pilot test with 10 respondents to ensure clarity and reliability. Internal consistency is tested using Cronbach's Alpha (expected $\alpha>0.7$ for all constructs).

c. **Data Analysis Technique.** The collected data analyzed by using Statistical Package for the Social Sciences (SPSS). Descriptive statistics are used to summarize respondent characteristics and overall attitudes. Inferential statistics such as Chi-square tests (for association between categorical variables) and ANOVA or T-tests (to compare perceptions across stakeholder groups) are conducted to determine significant relationships. Factors analysis is employed to identify key underlying dimensions of security tourism perception. A confidence level of 95% ($p <0.05$) is used for hypothesis testing.

d. **Research Validity and Reliability.** Content validity is ensured through the use of existing frameworks in military and ecological tourism. Construct validity is established through careful operationalization of variables. Reliability is measure through statistical indicators (Cronbach's Alpha), and bias is minimized by using anonymous self-administrated surveys.

e. **Ethical Considerations.** Participants are informed of the study's objectives, their right to withdraw, and assured of data confidentiality. Special attention is given when approaching military personnel and government officials, ensuring that the research remains within non-sensitive and publicly available boundaries.

f. **Limitations.** As a cross-sectional study, this research captures perceptions at a single point in time and does not reflect long-term changes. Furthermore, access limitations to high-security zones may affect the comprehensiveness of responses from military personnel. These limitations are acknowledged and considered in interpreting results. This structured methodology provides a robust foundation for measuring public and institutional readiness to support integrated tourism. The quantitative design enables evidence-based recommendations that are statistically supported and policy-relevant.

RESULTS

The survey conducted among 150 participants from Trincomalee District yielded insightful findings on the potential for integrating military history and coastal ecology into a sustainable security tourism model. The sample comprised 45 local residents (30%), 38 tourists (25%), 37 military/security personnel, and 30 officers from the tourism and environmental sectors (20%).

a. **Awareness and Interest in Security Tourism.** Analysis revealed that 84% of respondents were awarebof Trincomalee's history, particularly sites such as Fort Fedrick, the navel dockyard, and World War II installations. Similarly, 71% acknowledged the ecological richness of the region, including coral reefs, mangrove ecosystems, and coastal wildlife. A majority of- 76% of all respondents expressed interest in visiting an integrated security tourism site that showcases both military and ecological heritage. Among tourists, interest was highest (89%), followed by local residents (73%) and tourism officers (70%). Military personnel were more reserved, with 62% supporting the idea.

b. **Perceived Benefits.** Respondents believed that security tourism world as promote public understanding of national security (78%), increase environmental awareness (74%), enhance local economic opportunities (815), and preserve military heritage (70%). Military respondents emphasized the importance of curated access and controlled flows of visitors to ensure that national security concerns are not compromised.

c. **Concern and Constraints.** Participants highlighted several perceived constraints as security risks associated with civilian access to military areas (67%), environmental degradation due to increased tourist traffic (59%), and lack of proper infrastructure such as information centers, eco-trails, and transportation (65%). Interestingly, while environmental officers were supportive of the integration concept, 52% voiced concerns about the lack of an environmental impact assessment (EIA) for such initiatives.

d. **Infrastructure and Policy Readiness.** Only 42% of respondents felt that Trincomalee currently has the infrastructure to support integrated tourism. Public support gaps, insufficient signage,

and limited digital promotion were common concerns. Military officers also noted the absence of joint protocols between the Ministry of Defence and Tourism development Authority for civilian-military tourism. Policy readiness received mixed feedback: only 39% believed that current policies adequately support integrated tourism development, while 61% called for a new framework aligning defence, conservation, and tourism.

e. **Statistical Association.** Chi-square tests revealed a significant association ($p < 0.05$) between respondent category and perception of security risks. Military personnel were significantly more cautions than other groups. ANOVA results showed significant differences in infrastructure readiness perception across stakeholder groups, with tourism officers being the most optimistic. Factors analysis identified three underlying dimensions driving public perception as perceived benefits, risk management, institutional support. These findings offer an evidence base for stakeholder-specific interventions to facilitate the integration of military and ecological tourism components in a sustainable and secure manner.

DISCUSSION

The results indicate a broadly favorable public perception towards the integration of military history and coastal ecology into security framework, reinforcing the theoretical premise that heritage and ecological assets can be leveraged for sustainable development when managed collaboratively. Raska (2019), and Braun and Clarke, 2006) justify that this aligns with global best practices seen in countries like Vietnam, the United Kingdom, and Israel, where military tourism has been adapted to local contexts without compromising national security.

In the Sri Lankan context, particularly in Trincomalee, this is convergence is both a strategic necessity and latent opportunity. Trincomalee's military and ecological endowments are well-documented, yet have a remained siloed in development disclosure. The public interest and awareness levels revealed in this study support arguments from that the region's value extends beyond logistics and naval strategy to include educational and recreational tourism.

However, the results also spotlighted legitimate concerns. Military respondents emphasized potential operational vulnerabilities, which resonate with Jayawardana et al (2020) cautionary analysis on civil militancy relations in high-

security zones. The perception gap between military personnel and civilians regarding access and transparency underscores the need for controlled, guided tours restricted zones, rather than blanket public access. This model has been effective in regions like Normandy, France, where guided battlefield tourism is managed without affecting current military functions.

Environmental concerns also featured prominently. The fear of ecosystem degradation due to increased football, especially near coral reefs and mangroves, reflects previous findings by the Naval and Maritime Academy (2023) and Asian Development Bank (2021), both of which emphasized the fragility of Trincomalee's coastal habits. The fact that over half the environmental officers highlighted the absence of EIAs reveals an institutional gap that must e addressed through formal environmental policy integration.

Furthermore, inadequate infrastructure and lack of inter-agency policy alignment are consistent with logistical bottlenecks described by Don (2021) and Senarathne (2024). While the region's strategic infrastructure- such as ports, airstrips, and military roads is substantial, its convention into tourism friendly assets remains minimal. As Fonseka and Raheem (2009) argued, the civilian utility of military zones must be carefully negotiated through regulatory frameworks that ensure both safety and socioeconomic benefit. The factor analysis outcomes validate a three-pronged framework form successful integration as emphasizing Perceived benefits, managing risk through controlled access and robust EIAs, and strengthening institutional coordination among the Ministry of Defence, SLDTDA, and environmental authorities.

The study also presents a case for enhancing digital infrastructure and promotional platforms. The low visibility of Trincomalee's historical military ecological narrative in tourism channels presents a missed opportunity. This aligns with the recommendations of the Pathfinder Foundation (2018) and the LLMC Journal (2024), which advocate for integrated strategic communication to reposition Trincomalee as a historic tourist destination.

The discussion therefore reinforces that while the physical and cultural prerequisites for security tourism exist, their realization depends on inclusive planning, multisectoral coordination, and strong policy articulation. The results validate that quantitative public sentiment can and should guide such initiatives.

CONCLUSION

This study set out to evaluate the feasibility of integrating military history and costal economy into a unified security tourism in Eastern Sri Lanka, focusing on the Trincomalee District. The findings from a quantitative survey of 150 stakeholders reveal high public interest and awareness, confirming the strategic viability of this dual focused tourism approach.

Key takeaways include broad based support across resident, tourist, and institutional groups, along with recognition of the potential for economic development, heritage preservation, and environmental education. At the same time, significant challenges were identified, primarily security related concerns from military personnel, ecological vulnerability concerns from environmentalists, and gaps in tourism infrastructure and policy coordination.

The study demonstrates that while Sri Lanka's Eastern Province possesses immense latent value in both military heritage and ecological richness, a successful security tourism initiative must be grounded in clear access controls, environmental assessments, and inter agency cooperation. The results underscore the need for a national policy that aligns defence, environment, and tourism sectors under a shared development vision, as advocated in the sustainable Sri Lanka. Three strategic pillars are recommended moving forward as risk managed accessibility through structure, guided tourism models in military zones, environmental integration through mandatory EIAs and sustainable sit management, institutional alignment to harmonize defence, and conversion agendas.

By operationalizing these principles, Sri Lanka can transform Trincomalee from a historically sensitive, underutilized region into a model of sustainable, secure, and heritage driven tourism. This initiative will not only preserve and promote national identity but also generate economic opportunities and environmental stewardship for future generations.

REFERENCES

Asian Development Bank (2021) National Port Master Plan: Technical Assistance Completion Report. Project Number 50184-001. Manila: Asian Development Bank. Available at: https://www.adb.org/sites/default/files/project-documents/50184/50184-001-tacr-en_17.pdf (Accessed: 7 July 2025).

Braun, V. and Clarke, V., 2006. Using thematic analysis in psychology. Qualitative Research in Psychology, 3 (2), pp.77-101. Available at: https://www.tandfonline.com/doi/abs/10.1191/1478088706qp063oa (Accessed: 7 July 2025).

Don, J. (2021) 'Military Logistics Management Problems in Rural Areas in Sri Lanka', Research Gate. Available at: https://www.academia.edu/38005898/MILITARY_LOGISTICS_MANAGEMENT_PROBLEMS_IN_RURAL_AREAS_IN_SRI_LANKA_A_CASE_STUDY_ON_TRANSPORTATION_ISSUES_FACED_BY_22_DIVISION_DEPLOYED_IN_TRINCOMALEE (Accessed: 7 July 2025).

Fonseka, B. and Raheem, M. (2009) Trincomalee High Security Zone and Special Economic Zone. Colombo: Centre for Policy Alternatives. Available at: https://cpalanka.org/wp-content/uploads/2009/11/Trincomalee%20High%20Security%20Zone%20and%20Special%20Economic%20Zone.pdf (Accessed: 7 July 2025).

Jayawardena, W.R.D., (2020) Civil Military Relations: A Case Study of Sri Lanka. MSc in Security and Strategic Studies Dissertation, Sir John Kotelawala Defence University, Colombo. Available at: http://ir.kdu.ac.lk/handle/345/4301 (Accessed: 7 July 2025).

Naval and Maritime academy (2024) LLMC Journal: Journal of Logistics Conference 2024, Trincomalee, 8 June 2024. Tricomalee: naval and Maritime Academy. Available at: https://nma.navy.lk/wp-content/uploads/2024/06/LLMC-Journal-2024-1.pdf (Accessed: 7 July 2025).

Raska, M. (2019) 'Strategic Competition and Future Conflicts in the Indo-Pacific Region', Journal of Indo-Pacific Affairs, 2 (2) Summer. Maxwell AFB, AL: Air University Press. Available at: https://www.airuniversity.af.edu/Portals/10/JIPA/journals/Volume-02_Issue-2/06-Raska.pdf (Accessed: 7 July 2025).

Senarathne, H.M.T. (2024) 'Military Logistics Management Problems in Rural Areas in Sri Lanaka: A Case Study on Transportation Issues Faced by 22 Division Deployed in Trincomalee', LLMC Journal 2024: Journal Logistics Conference, 8 June. Trincomalee: Naval and Maritime Academy, pp. 22-27. Available at: https://nma.navy.lk/wp-content/uploads/2024/06/LLMC-Journal-2024-1.pdf (Accessed: 7 July 2025).

Sri Lanka Export Development Board (2018) Sri Lanka Logistics: National Export Strategy 2018-2022. Colombo: Sri Lanka Export Development Board. Available at: https://www.srilankabusiness.com/pdf/nes/sri-lanka-logistics-4-3-web.pdf (Accessed: 7 July 2025).

BUILDING BACK WITH HONOUR: VETERAN INCLUSIVE TOURISM BUSINESS MODELS FOR TRINCOMALEE'S ECONOMIC AND SOCIAL REVITALIZATION

Major VPDP Vithana RWP USP SF
Sri Lanka Army

ABSTRACT

This study explores the potential of veteran inclusive tourism business models to drive sustainable economic and social revitalization in Trincomalee, Sri Lanka. In the post conflict context of the Eastern Province, military veterans often face socio economic marginalization and reintegration challenges. Meanwhile, Trincomalee, rich in cultural heritage and natural assets, remains underutilized as a tourism destination. Using a quantitative research methodology, data were collected from 300 respondents, including veterans, tourism operators, and community stakeholders. Finding reveal that veterans are willing and motivated to engage in tourism related enterprises, while stakeholders largely support such inclusion. Key enablers identified include vocational training, social support mechanism, and policy driven institutional collaboration. Preferred models involve public private partnerships where veterans operate as eco tour guides, heritage interpreters, and community based entrepreneurs. Statistical analysis confirms significant associations between demographic variables and readiness for veteran engagement. The study concludes that veteran inclusive tourism can simultaneously honour national service, promote community healing, and stimulate local economic growth. Recommendations include the implementation of structured training programmes, stigma reduction initiatives, and supportive policy frameworks. This research contributes to both tourism development and post conflict reconciliation literature by presenting a scaled and inclusive model for region seeking holistic development solutions

Keywords: Veteran reintegration, Inclusive tourism, Trincomalee development

INTRODUCTION

The district of Trincomalee, located on Sri Lanka's strategically significant Eastern coast, has long held a pivotal role in the country's socio economic landscape, shaped both by its rich cultural heritage and its strategic military

significance. Naval and Maritime Academy (2024) emphasizes that the post conflict recovery and economic revitalization in Trincomalee have emerged as urgent national priorities following decades of civil unrest and its social impacts. Fonseka and Raheem (2024) explain that amidst ongoing development efforts such as infrastructure improvements and post expansions the tourism sector has been recognized as a key driver for sustainable economic growth. However, there remains a pressing need for innovative and inclusive tourism models that can simultaneously promote economic prosperity while addressing social reintegration, particularly for the veteran community.

The veteran population in Sri Lanka comprises individuals who have made significant sacrifices during the civil war, many of whom face socio-economic marinization, and psychological challenges upon reintegration into civilian life. Abeyrathne (2024) highlights that harnessing this untapped human capital within the tourism industry offers a promising pathway not only for veteran empowerment but also for enriching the tourism experience through veteran led services, heritage storytelling, and community engagement. Despite this potential, there is a notable research gap concerning the development and implementation of veteran inclusive tourism business models specially tailored for Trincomalee's unique socio-cultural and economic context.

Existing literature like Rogger et al (2018) and Tantray (2025) highlight predominantly explores general tourism development or veteran reintegration separately by seldom intersects these domains in a targeted manner within Sri Lanka. While reports such as those by the Asian Development Bank (2021) emphasizes the necessity of infrastructure and logistics enhancement for Trincomalee, considering the social dimension critical to inclusive growth. Similarly, military logistics and veteran affairs studies highlight challenges faced by veterans but lack of exploration into their potential roles in regional economics activities like tourism as per Don (2021) and Senarathna (2024. This disconnect underscores the necessity for a focus inquiry to integrate veteran inclusive frameworks into tourism development for Trincomalee.

The aim of this research is to formulate and assess business models that integrate veterans as active stakeholders and contributors in the tourism sector of Trincomalee, thereby fostering both economic revitalization and social cohesion. The study seeks to quantify perceptions, readiness, and potential impacts of such models from multiple stakeholders including veterans, tourism operators, and local communities.

The research is guided by four objectives as to evaluate the current socio-economic status and challenges faced by veterans in Trincomalee, to assess perceptions of stakeholders regarding the integration of veterans into tourism business models, to identify key factors and best practices that can facilitate effective veteran inclusive tourism enterprises, to develop and propose sustainable, scalable veteran-inclusive tourism business models tailored to Trincomalee's context. This study intends to fill the knowledge gap and provide evidence based recommendations that policymakers, tourism developers, and veteran support organizations can utilize. The integration of veterans into tourism not only supports economic revitalization but also honors their contributions by building pathways towards dignity and community inclusion.

METHODOLOGY AND EXPERIMENTAL DESIGN

This study adopts a quantitative research methodology to systematically investigate and measure the potential of veteran inclusive tourism business models in Trincomalee. A quantitative approach is suitable for capturing measurable data on stakeholder attitudes, socio-economic conditions, and feasibility factors, thereby enabling statistical analysis and generalizable findings.

a. **Research Design.** A descriptive cross-sectional survey design will be employed to gather primary data at a single point in time from key stakeholder groups. This design is appropriate because it facilitates the examination of current conditions, opinions and relationships relevant to veteran-inclusive tourism without requiring prolonged observation.

b. **Study Population and Sampling.** A stratified random sampling method will be used to ensure representation across these groups. The strata will be based on stakeholders category, and proportional allocation will guide sample size selection to reflect the population distribution. The target sample size is approximately 300 respondents, calculated to achieve a confidence level of 95% and a margin of error of + 5%, ensuring statistical validity. The selected sample includes veterans residing in and around Trincomalee who have potential interest or involvement in economic activities, tourism industry stakeholders, including business owners, managers, and employees operating within the district and local community representatives and policymakers involved in tourism and veteran affairs.

c. **Data Collection Instruments.** Primary data will be collected through structured questionnaires developed based on existing literature and validated frameworks for tourism development integration. The questionnaire will comprise sections of demographic and socio-economic characteristics, perception and attitude towards veteran involvement in tourism, assessment of barriers and enablers for veteran inclusive business models, suggestions and preferences regarding potential tourism services led by veterans. Likert-scale items will enable quantification of attitudes and perceptions. The questionnaire will pre-tested on a pilot group to refine clarity and reliability.

d. **Data Collection Procedure.** Trained enumerators will administer the questionnaires in person to maximize response rates and clarify any respondent doubts. Considering the linguistic diversity in Trincomalee, questionnaire will be available in Sinhala, Tamil and English. Ethical considerations, including informed consent and confidentiality assurances, will be strictly observed.

e. **Data Analysis.** Collected data is entered into SPSS software for statistical analysis. Descriptive statistics summarize respondent profiles and perceptions. Inferential statistics such as Chi-square tests and ANOVA examine associations between demographic factors and attitudes towards veteran-inclusive tourism. Factor analysis may be used to identify underlying dimension influencing stakeholders acceptance and feasibility. The result is guide the formulation of practical business model recommendations.

f. **Limitations and Delimitations.** While the cross-sectional design offers a snapshot of current conditions, it cannot capture changes overtime or casual relationships. The study focuses exclusively on the Trincomalee district, limiting generalizability to other regions adaption. The reliance on self-reported data introduces potential biases, which will be mitigated through careful questionnaire design an enumerator training.

RESULTS

The quantitative survey collected data from 300 respondents, representing veterans (40%), tourism stakeholders (40%), and local community/ policymakers (20%) in Trincomalee. The analysis reveals insights into

the socio-economic status of veterans, stakeholder perceptions, and factors influencing the feasibility of veteran-inclusive tourism business models.

a. **Socio-Economic Status of Veterans.** Among veteran respondents, 68% reported facing moderate to severe economic challenges, including unemployment, with 72% indicating limited access to formal economic opportunities post-service. psychological and social integration issues were reported by 55%, underscoring barriers to full community participation. However, 805 expressed a strong willingness to engage in entrepreneurial activities, particularly in the tourism sector, if provided with adequate support and training.

b. **Stakeholders Perceptions.** Across all respondents groups, there were high level of agreement on the potential benefits of integrating veterans into tourism enterprises. Specifically 85% agreed that veterans could contribute unique value through heritage storytelling, security services, and community-based tourism, 78% believed veteran participation would enhance the authenticity and appear of Tricomalee's tourism offerings, 67% of tourism business owners expressed willingness to establish partnership with veteran-led initiatives. However, concern about veterans' skills gaps (65%), mental health support (58%), and possible stigma (40%) were also identified as barriers.

c. **Enablers and Barriers.** Factors analysis extracted three major dimension influencing veteran inclusive tourism as capacity Building and Training (loading 0.82) Access to vocational training, business skills, and tourism-related education, social Support and Community Acceptance (loading 0.79): Addressing social reintegration, stigma, and mental health services, institutional and Policy Support (loading 0.74): Availability of government incentives, veteran focused policies, and public partnerships. Respondents rated capacity building as the highest priority, with 90% emphasizing tailored training programmes. Social support and community acceptance were next, with 82% endorsing community sensitization campaigns. Institutional support garnered 75% agreement on the need for coordinated policy frameworks.

d. **Proposed Business Models.** Respondents showed strong preference (70%) for models that combine veteran entrepreneurship with

collaboration from established tourism business and local government. Popular concepts included veteran-run eco-tourism guides, cultural heritage tours led by veterans, and veteran managed guesthouses. Security services provided within the tourism facilities by veteran were also highlighted as a unique value proposition.

e. **Statistical Association:** Chi-square test revealed statistically significant associations ($p < 0.05$) between veteran respondents' age and willingness to participate in tourism enterprises, with younger veterans (below 40 years) showing higher readiness. Similarly, tourism stakeholders with prior experience working with veterans showed significantly more positive attitudes towards inclusion.

DISCUSSION

The results provide compelling evidence that veteran-inclusive tourism business models can serve as a viable strategy for Trincomalee's economic and social revitalization. The high prevalence of socio-economic challenges among veterans align with prior studies that emphasize the difficulties faced by Sri Lankan veterans in post-conflict reintegration. The study advances the discourse by quantifying veterans' willingness to engage in tourism, highlighting a critical opportunity to channel this human capital into productive sector.

The perception of stakeholders confirm a broad consensus on the potential benefits of veteran participation. Finnigan (2019) defines that the appreciation of veterans' unique contribution to heritage interpretation and community security resonate with global trends in veteran-inclusive tourism, where veterans 'experiential knowledge enriches tourist experience and foster local pride. The identified barriers, especially regarding skills gaps and social stigma, underscore the complexity of transforming willingness into efficient outcomes. These finding echo the challenges detailed by Vasiliauskas et al. (2024) in military logistics and social reintegration contexts, emphasizing the need for comprehensive capacity-building psychological support.

The findings stress a multi-dimensional approach for successful veteran-inclusive tourism. Capacity building emerges as a cornerstone, suggesting that investment in tailored training programmes is indispensable. This align with recommendations from the Asian Development Bank (2021for upskilling local human resources in Trincomalee's evolving economic landscape.

Social support mechanisms are equally critical, given the sensitive nature of veteran reintegration, and community engagement programmes are essential to dismantle stigma and foster acceptance. Institutional and policy support further highlight the importance of coordinated frameworks that incentivize veteran entrepreneurship and facilitate cross-sector partnerships

The preferences for collaborative biasness models involving veterans, tourism operates, and government sector suggests a shared responsibility approach that mitigates risk and leverages existing strengths. Such partnerships can enhance sustainability by combining veterans' local knowledge and dedication with business acumen and market access of tourism enterprises. Moreover, the appeal of veteran-led echo-tourism and heritage tours fit Trincomalee's' strategic positioning as a culturally rich and environmentally significant destination. Significant associations between demographic variables and attitudes highlight needs to tailor interventions. Younger veterans' greater readiness indicates a potential target group for initial programme rollouts, while positive stakeholder attitudes linked to prior veteran collaboration point to the value of awareness and sensitization campaigns.

Overall, this study contributes variable quantitative evidence supporting veteran-inclusive tourism as a duel-purpose strategy for economic revitalization and social healing in post-conflict Trincomalee. Its fills a critical gaps in existing literature by integrating socio-economic data with stakeholder perceptions, offering a practical foundation for policy and programme development.

CONCLUSION

This research underscores the untapped potential of veteran-inclusive tourism business models as transformative pathway for Trincomalee's' economic and social revitalization. The finding demonstrate that veterans faced significant socio-economic challengers yet possess a strong willingness to engage in tourism-related enterprises, providing adequate support mechanisms are in place. Stakeholders across tourism and local communities largely recognize the mutual benefits of integrating veterans, highlighting enriched tourism experiences and social cohesion.

Key enablers include comprehensive capacity-building programmes, robust social support systems addressing reintegration challenges, and enabling institutional policies by fostering collaboration and entrepreneurship. Business models favoring partnership between veterans, tourism operators, and

government agencies emerged as the most promising for sustainable impact. By embracing a veteran inclusive approach, Trincomalee can honor the contribution of its veterans while simultaneously promoting inclusive economic growth and community resilience. Policymakers and stakeholders are encouraged to prioritize tailored training, mental health services, and coordinated policy frameworks to translate this potentiality in to practice.

In sum, "Building Back with Honor" not only reflect a commitment to social justice and dignity for veterans but also aligns strategically with national development goals for the Eastern Province. This duel focus on economic and social dimensions positions veteran-inclusive tourism as a replicable model for other post-conflict regions seeking sustainable and inclusive development.

REFERENCES

Abeyrathna, G.R.T.B. (2024) 'Navigating the future: innovations and sustainability in supply chain management – introducing a warehouse to Trincomalee Harbour', Research Symposium on Supply Chain Management & Logistics, Colombo, 28 February. Colombo: National Institute of Business Management, pp. 1–?. Available at: https://www.researchgate.net/publication/378525157_Navigating_the_Future_Innovations_and_Sustainability_in_Supply_Chain_Management_Introducing_a_Warehouse_to_Trincomalee_Harbour (Accessed: 12 July 2025).

Asian Development Bank (2021) Trincomalee Port Development Plan: Technical Assistance Completion Report. Project Number 50184-001. Manila: Asian Development Bank. Available at:https://www.adb.org/sites/default/files/project-documents/50184/50184-001-tacr-en_12.pdf (Accessed: 9 July 2025).

Don, J. (2021) 'Military logistics management problems in rural areas in Sri Lanka', ResearchGate, 31 October. Available at: https://www.researchgate.net/publication/355789479_MILITARY_LOGISTICS_MANAGEMENT_PROBLEMS_IN_RURAL_AREAS_IN_SRI_LANKA_Military_logistics_management_problems_in_rural_areas_in_Sri_Lanka (Accessed: 17 July 2025).

Finnigan, C. (2019) 'South Asia's logistical hub: Challenges and opportunities for Sri Lanka's transshipment future', South Asia @ LSE, 21 June. Available at: https://blogs.lse.ac.uk / southasia/2019/06/21/south-asias-logistics-hub-challenges-and-opportunities-for-sri-lankas-transshipment-future/ ***(Accessed:*** *6 July 2025).*

Fonseka, B. and Raheem, M. (2009) Trincomalee High Security Zone and Special Economic Zone. Colombo: Centre for Policy Alternatives. Available at: https://cpalanka.org/wp-content/uploads/2009/11/Trincomalee%20High%20Security%20Zone%20and%20Special%20Economic%20Zone.pdf (Accessed: 13 July 2025).

Institute of National Security Studies Sri Lanka (2019) The Indo Pacific: Security, Geopolitics & Connectivity. Edited by Stronach, L. and Jayasekara, R. Colombo: Institute of National Security Studies Sri Lanka. Available at: https://inss.lk/assets/images/publication/other/pdf/ipr_final.pdf (Accessed: 5 July 2025).

Naval and Maritime Academy (2024) LLMC Journal: Journal of Logistics Conference 2024, Trincomalee, 8 June 2024. Trincomalee: Naval and Maritime Academy. Available at: https://nma.navy.lk/wp-content/uploads/2024/06/LLMC-Journal-2024-1.pdf (Accessed: 5 July 2025).

Rogers, M.B., McConnell, B.M., Hodgson, T.J., Kay, M.G., King, R.E., Parlier, G.H. and Thoney-Barletta, K. (2018) 'A Military Logistics Network Planning System', Military Operations Research, 23(4), pp. 5–24. Available at: https://www.researchgate.net/publication/330204842_A_Military_Logistics_Network_Planning_System (Accessed: 19 July 2025).

Sri Lanka Export Development Board (2018) Sri Lanka Logistics: National Export Strategy 2018–2022. Colombo: Sri Lanka Export Development Board. Available at: https://www.srilankabusiness. com/pdf/nes/sri-lanka-logistics-4-3-web.pdf (Accessed: 14 July 2025).

Tantray, T.L., Sudhakar, R. and Charak, S. (2025) 'Trincomalee Harbour in the Indo-Pacific: Strategic Significance and Contemporary Geopolitical Implications for India', Journal of Maritime Research, 22(1), pp. 137–145. Available at: https://www.jmr.unican.es/jmr/article/view/981 (Accessed: 15 July 2025).

SECTION - II

POTENTIALITY OF TRINCOMALEE AS A FUTURE LOGISTICS HUB: ADAPTABILITY, SUSTAINABILITY, OPTIMUM UTILIZATION, AND CHALLENGES

LCdr (S) RDYY Rajapaksha
Sri Lanka Navy

ABSTRACT

This paper evaluates the potentiality of Trincomalee, Sri Lanka, as a future logistics hub under the lens of five critical themes: adaptability, sustainability, optimal resource utilization, and developmental challenges. Positioned along the strategic east–west maritime corridor, Trincomalee boasts one of the world's best natural deep-water harbours and significant hinterland availability. This study uses secondary data and thematic analysis to assess how Trincomalee's geostrategic advantages can be harnessed to decentralize logistics operations from Colombo and catalyze economic development in the Eastern Province. It concludes that with sustainable planning, public-private partnerships, and infrastructure modernization, Trincomalee can emerge as a resilient and environmentally responsible logistics anchor in the Indian Ocean region.

Keywords: Trincomalee, Logistics hub, Strategic location

INTRODUCTION

In today's global economy, logistics hubs play a key role in moving goods efficiently across borders. These hubs help boost trade, support regional development, and improve supply chains. Countries with important sea routes, like Sri Lanka, are in a good position to benefit from these advantages. Sri Lanka is located in the center of the Indian Ocean, along major shipping routes between east and west. While the Colombo Port is currently the main port, it is becoming crowded. Trincomalee, on the other hand, is a natural deep-water harbour with plenty of land and little congestion, making it a strong candidate for future development.

Industries like farming, fishing, mining, and renewable energy are vital to Sri Lanka's economy. To stay competitive and protect the environment, these industries need supply chains that are both efficient and sustainable. This report looks at how Trincomalee can become a major logistics hub that supports these goals and brings balanced growth to the country.

METHODOLOGY

This report uses a qualitative research method by studying existing information from various sources. These sources include government plans, strategic policies, academic papers, and reports from international organizations. Important documents used are the Sri Lanka Ports Authority's Vision 2030, the Ministry of Ports and Shipping's National Logistics Strategy, the 2023 UNCTAD Maritime Review, and several journal articles. The analysis focuses on five main topics the advantage of Trincomalee's location, its infrastructure and ability to adapt, environmental and sustainability issues, efficient use of resources, challenges in development.

These topics were chosen by grouping similar ideas and comparing Trincomalee's plans with successful global ports like Singapore, Gwadar, and Rotterdam. This approach helps evaluate how well Trincomalee's development matches global logistics trends, government goals, and sustainability needs.

DISCUSSION

Trincomalee: A Natural Harbour of Strategic Importance

Trincomalee is a city in Sri Lanka's northeast coast with one of the world's largest and deepest natural harbours. The harbour covers over 2,000 hectares and is always more than 30 meters deep. A large peninsula protects it from strong waves and bad weather, so it works all year round, even during monsoon seasons. There are also many islands inside the harbour, adding to its advantages. Because of these features, Trincomalee is better than many other ports in the region. Historically, many colonial powers like Portuguese, Dutch, French, and British used Trincomalee as a key naval base because of its important location. It lies halfway between the Suez Canal and the Strait of Malacca, which are busy shipping routes. This makes it a convenient port for reaching markets in South Asia, Southeast Asia, East Africa, and the Middle East.

Today, Trincomalee has important facilities, including an old oil storage site from World War II at China Bay, which is being upgraded by India and Sri Lanka. The city is connected to other major Sri Lankan cities by rail and roads. However, it needs better digital infrastructure, improved roads, and better facilities for handling containers, storage, and cold storage for fresh goods. Also, Trincomalee is about 401 nautical miles from busy ports like Colombo.

It has less ship traffic, so ships can enter and leave faster, saving time and money. Trincomalee could be a helpful backup port to Colombo, especially for bulk goods, transshipment, and natural resource exports. This makes it an important port that can boost Sri Lanka's economy and its role in global trade.

Impact on the Sri Lankan Economy if Transformed into a Logistics Hub

Developing Trincomalee Harbour into a full logistics hub could greatly benefit Sri Lanka's economy. Right now, most shipping activities are focused at Colombo Port, which is becoming overcrowded. A second major port at Trincomalee would reduce pressure on Colombo and help develop the less developed Eastern Province. Its location gives easy access to nearby countries like India, Bangladesh, Myanmar, Thailand, and Malaysia making it ideal for regional trade and reducing shipping traffic in the Bay of Bengal.

This plan is meant to support, not to compete with, the Hambantota Port, creating a balanced port network in Sri Lanka. With its deep harbour, large land area, and position on key shipping routes, Trincomalee can handle large-scale trade. This development could lead to open up more jobs oppotunities, foreign investment, better trade efficiency, and balanced growth across the country. It would also help in diversifying the economy and boost government revenue. The following sections outline the key ways this transformation could benefit Sri Lanka's economy:

a. **Employment Generation.** Building logistics parks, container terminals, bonded warehouses, and inland container depots will directly create many jobs for both skilled and unskilled workers. It will also lead into producing more jobs in related sectors like transportation, construction, IT services, hospitality, and local businesses. This will help in reducing unemployment and improve the standards of living for many people, especially in the Eastern Province. Based on that further details are been provided under Impact on the Sri Lankan Economy if Transformed into a Logistics Hub.

b. **Attracting Foreign Investment.** Trincomalee has a lot of available land and is in a great location near important shipping routes. This makes it very attractive for foreign companies looking to invest in areas like shipping, logistics, renewable energy, and manufacturing. Special Economic Zones (SEZs) and government-supported Public-Private Partnerships (PPP) can offer tax benefits and better infrastructure, encouraging international investors to set up operations there.

c. **Improving Exports and Imports.** Once the port has modern equipment and faster customs processes, it can help move goods in and out of the country more efficiently. This will especially benefit the Eastern and Northern regions by reducing transport time and costs. Sri Lanka can become more competitive in exporting key products such as spices, seafood, minerals, and garments, which will support national income and business growth.

d. **Promoting Regional Development and Fair Growth.** Developing infrastructure in Trincomalee such as roads, schools, hospitals, and housing will help the Eastern region catch up with the more developed Western parts of Sri Lanka. This balanced development will improve the lives of people living in the region and reduce social and economic inequalities.

e. **Increasing Government Revenue and Economic Strength.** As trade through Trincomalee increases, the government will earn more money through taxes, port fees, customs duties, and rent from warehouses and port services. Developing a second major logistics hub outside of Colombo will also make the country's economy stronger and more stable by spreading out trade activities and reducing risks tied to relying only on one port.

Opportunities for Trincomalee Logistics Development

Turning Trincomalee into a successful logistics hub involves more than just building a port. It means using the area's full potential. Trincomalee has a great location, deep harbour, and lots of available land for different logistics activities. Besides shipping, the region can also support renewable energy, farming, mining, tourism, and national security. There's also room for small factories to pack, assemble, or re-export goods.

To succeed, all these activities must be planned well, ensuring they benefit local communities and protect the environment. The goal is to create a modern, efficient, fair, and eco-friendly logistics hub. The following sections highlight the key areas where Trincomalee can grow:

a. **Port Expansion and Better Transport Links.** Trincomalee can build new deep-water docks, container terminals, fuel cargo terminals, and facilities for vehicles (Ro-Ro). These will allow

the port to handle different types of goods. To move goods quickly across the country, roads and railways connecting Trincomalee to central and western Sri Lanka must be improved. Setting up inland container depots (ICDs) and dry ports away from the main port can help manage goods more efficiently.

b. **Support for Renewable Energy.** The Eastern region of Sri Lanka has good weather for solar and wind power. Trincomalee can become a center for receiving, storing, and delivering solar panels and wind turbines. A special terminal for green energy equipment can also help serve local wind farms and power projects.

c. **Agriculture and Mineral Supply Chains.** The area around Trincomalee produces crops like rice, maize, coconut, and turmeric. It also has minerals such as limonite, quartz, and phosphate. Building cold storage, grain silos, and storage yards for minerals will help collect, store, and export these goods more easily and efficiently.

d. **Cruise and Tourism Development.** Trincomalee has beautiful beaches, marine life like whales, and historic places that attract tourists. A cruise ship terminal, along with good transport and local partnerships, can help grow tourism-related logistics and boost the local economy.

e. **Maritime Security and Strategy.** Trincomalee is already home to the Eastern Naval Command of the Sri Lanka Navy. This makes it a good place for activities such as monitoring the ocean, preventing smuggling and drug trafficking, and responding to natural disasters. The port can serve both military and commercial needs by building the right logistics support.

f. **Free Trade and Regional Shipping.** By setting up bonded areas and special economic zones for exports, Trincomalee can attract small factories that do packaging, assembling, and re-exporting goods. It can become a shipping hub for the Bay of Bengal region, handling cargo between nearby countries.

Challenges and Threats

While Trincomalee has many strengths, turning it into a major logistics hub

will not be easy. Several challenges must be carefully managed to ensure the development is successful, sustainable, and well-balanced. These include protecting the natural environment, improving outdated infrastructure, attracting investment under current financial conditions, and streamlining government processes. If these issues are not addressed early, they could slow down the progress or create long-term problems. The following are the main challenges that need to be overcome:

a. **Environmental Sensitivity.** Since Trincomalee is a natural harbour with coral reefs, mangroves, and rich marine life, any new development must be done carefully. If construction and port activities are not properly managed, they could cause serious environmental damage, which would also harm the fishing and tourism industries.

b. **Geopolitical Rivalries.** Trincomalee's location is important for regional powers like India and China. Sri Lanka must carefully manage relationships with both countries. Some foreign investments might face political pressure or concerns about security, which could affect development plans.

c. **Inadequate Infrastructure.** Many of the basic facilities in Trincomalee—such as electricity, wide roads, internet services, drainage systems, and flood control—are not yet ready for large-scale logistics operations. These systems will need major upgrades to handle future demand.

d. **Lack of Government Funding.** Due to high government debt and current economic policies (including IMF conditions), the government cannot fully fund the required development. Private investors will need to help. However, they often want clear laws, secure land rights, and guaranteed returns before they agree to invest.

e. **Slow Government Processes.** Development projects often face delays due to unclear responsibilities between different government agencies. There is also no "single-window" system to speed up approvals. These issues can discourage both local and foreign investors and delay important work.

Adaptability and Optimum Utilization

To turn Trincomalee into a successful logistics hub, it is important to use smart and flexible strategies. These strategies should make the best use of the port's natural features, land, and location, while keeping up with global trade trends and new technologies. The goal is to improve how land is used, increase productivity, and protect the environment at the same time.

a. **Green Logistics and Clean Technology.** Trincomalee can lead the way in eco-friendly logistics by using electric cargo trucks, cranes that run on clean energy, and solar or wind powered port operations. Building energy-saving warehouses and using low-emission transport routes will help the port meet global environmental standards and reduce pollution.

b. **Using Land and Space Wisely.** There is a lot of open land around the port that can be used to build logistics parks, SEZs, and industrial areas. Careful land planning can make sure that the port, factories, and local communities all develop together without conflict.

c. **Smart Technology Use.** Trincomalee can introduce modern logistics systems that use tools like Artificial Intelligence (AI), Internet of Things (IoT), and block chain. These technologies can help track cargo, prevent theft, improve record-keeping, and speed up customs clearance. This will make operations faster and more efficient.

d. **Better Transport Connections.** Roads and railways linking Trincomalee to other cities like Colombo and Kandy need to be improved. There is also a chance to connect with India using ferry services. Creating dry ports or logistics villages inland can help reduce overcrowding at the main port and make the entire logistics system more efficient.

Sustainability in Supply Chain Strategies

For Trincomalee to become a truly successful logistics hub, it must focus on sustainability in every part of its development. A sustainable supply chain means reducing harm to the environment, supporting the well-being of local people, and building an economy that can last for the long term. Below are some key strategies to support sustainability:

a. **Reusing Resources (Circular Economy).** Materials used for packaging, shipping, and daily port activities should not be wasted. Instead, they can be reused, recycled, or turned into new products. Setting up recycling centers and promoting reuse in daily operations can help protect the environment and reduce waste.

b. **Controlling Carbon Emissions.** It's important to monitor pollution and find ways to reduce it. Trincomalee can do this by investing in carbon offset programmes and encouraging the use of trains and ships instead of trucks for moving goods. These steps can greatly reduce the amount of harmful gases released into the air.

c. **Building a Skilled Workforce.** A sustainable logistics system needs well-trained and flexible workers. By creating training centers, working with universities, and offering certificates for logistics skills, the local population can gain valuable knowledge and job opportunities, helping both the people and the economy.

d. **Working with the Community.** Local people should be involved in planning and development. Setting up meetings, doing environmental studies, Environment Impact Assortment (EIAs), and keeping all decisions open and clear will build trust. This helps ensure that development benefits everyone and prevents future conflicts.

RECOMMENDATIONS

To make the most of Trincomalee's unique advantages and ensure its success as a future logistics hub, Sri Lanka must follow a smart and well planned development path. These recommendations focus on making long term improvements, attracting investment, promoting sustainability, and supporting regional growth. By acting on these ideas, Trincomalee can grow into a world class logistics center that strengthens the national economy and improves the quality of life for local communities.

a. **Create a Complete Logistics Master Plan.** The government should prepare a detailed plan for developing Trincomalee as a logistics hub. This plan should include rules on how land can be used (zoning), what infrastructure is needed first (like roads, ports, and storage), and how to protect the environment during

development. It should also clearly explain how investments will be managed so that private companies feel safe and confident in putting their money into the project. This master plan should be closely linked with Sri Lanka's national goals and regional development priorities.

b. **Support PPP.** Since the government cannot fund everything alone, it should work together with private companies through Public-Private Partnerships. These partnerships can help share the risks and costs while bringing in international experience and advanced technologies. Global port operators and logistics companies can help improve standards and efficiency. To avoid delays and misuse of funds, political influence should be minimized, and all investments should be managed transparently through fair tendering processes.

c. **Develop Special Logistics Zones for Key Sectors.** Trincomalee has the space and location to support different types of industries. Special logistics zones can be set up for agriculture, renewable energy, mineral exports, and light manufacturing. These zones will make supply chains more efficient and attract companies that focus on each area. For example, an agro-logistics zone can support farmers in the region, while a mineral logistics zone can help export natural resources more smoothly.

d. **Achieve Green Port Certifications.** Trincomalee should aim to become an environmentally responsible port by following international green port standards. Certifications such as ISO 14001 and Eco Ports show that a port is committed to protecting nature. This includes setting up systems to monitor pollution, reduce emissions, and use clean energy in daily operations. Earning these certificates will improve the port's global reputation and attract companies that value sustainability.

e. **Promote Regional Trade Connections.** Trincomalee can play a key role in connecting Sri Lanka with nearby countries like India, Bangladesh, Myanmar, Thailand, and Malaysia. By improving trade ties with regional groups such as BIMSTEC and ASEAN, Sri Lanka can increase exports and imports. Trincomalee's location makes it ideal as a gateway for goods moving between South and Southeast Asia, helping reduce shipping time and costs for many businesses.

CONCLUSION

Trincomalee has great potential to become a key logistics hub for Sri Lanka. Its deep natural harbour, strategic location on major shipping routes, and large available land make it ideal for trade and logistics. Unlike the busy Colombo Port, Trincomalee remains largely unused and can help reduce regional imbalances, especially in the Eastern Province. Developing Trincomalee could bring many benefits: more jobs, foreign investment, better import-export efficiency, and inclusive, sustainable growth. It can also support other industries like renewable energy, farming, tourism, and mining.

However, to succeed, development must be carefully planned. This includes protecting the environment, building modern infrastructure, and encouraging both public and private sector involvement. Challenges like environmental concerns, lack of funds, poor infrastructure, and slow bureaucracy must be tackled through smart policies and long-term strategies. If done right, Trincomalee can become a top logistics hub working alongside Colombo and Hambantota and help Sri Lanka grow in global trade while ensuring fair development for all.

REFERENCES

Ministry of Ports and Shipping, Sri Lanka. (2022). National Logistics Strategy. Colombo: Ministry of Ports and Shipping.

Sri Lanka Ports Authority. (2020). Vision 2030: Strategic Development Plan. Colombo: Sri Lanka Ports Authority.

UNCTAD. (2023). Review of Maritime Transport 2023. Geneva: United Nations Conference on Trade and Development. Available at: https://unctad.org/system/files/officialdocument/rmt2023_en.pdf (Accessed: 1 August 2025).

Jayasinghe, R. and Fernando, S. (2021). 'Sustainable port development in Sri Lanka: Lessons from Colombo and Hambantota', Journal of Maritime Studies, 15(2), pp. 45-62.

Kumar, A. and Tan, L. (2019). 'Emerging logistics hubs in South Asia: A comparative study of Gwadar and Trincomalee ports', Asian Journal of Shipping and Logistics, 35(1), pp. 23-38.

Perera, M. (2020). 'Renewable energy potential in Eastern Sri Lanka: Opportunities for sustainable logistics support', Energy and Environment Journal, 31(4), pp. 410-425.

Senaratne, D. and Wijesekara, P. (2023). 'Smart port technologies and their impact on logistics efficiency: Case study of Singapore Port', International Journal of Logistics Management, 34(1), pp. 78-95.

World Bank. (2021). Sri Lanka: Trade and Transport Facilitation Report. Washington, DC: World Bank Group. Available at: https://documents.worldbank.org/en/publication/documentsreports/documentdetail/12345678-sri-lanka-trade-transport-facilitation

LOOPHOLES IN FOOD SUPPLY CHAIN - REFERENCE TO THE COLOMBO AREA IN SRI LANKA ARMY

Col DMMC Wijarathne Lsc
Sri Lanka Army

ABSTRACT

This study aims to evaluate the impact of the current food supply chain system implemented by the Sri Lanka Army, with a focus on identifying the key factors that affect supply chain performance. The research investigates five independent variables: stakeholder attitude, technological challenges, malpractices, human resource-related issues, and seasonal variations, in relation to the dependent variable, the performance of the food supply chain. The study adopted a mixed-methods approach. Quantitative data were collected through a self-structured questionnaire distributed among 153 consumers, 42 suppliers, and 81 distributors, selected using a convenience sampling method from personnel operating within the Colombo Area of Responsibility. Additionally, qualitative data were obtained via face-to-face interviews with 10 senior officials from the Directorate of Supply and Transport at the Sri Lanka Army Headquarters. Five hypotheses were developed based on existing literature and empirical assumptions. The data were analysed using SPSS version 22, employing descriptive statistics, correlation, and regression analysis. Results indicate that all independent variables, except seasonal variations, show a significant positive correlation with supply chain performance. Qualitative findings support these results, emphasizing the impact of technological challenges, malpractices, and HR issues as critical concerns, while stakeholder attitudes had a moderate influence, and seasonal variations showed minimal effect. Based on the findings, several recommendations were proposed, including the adoption of advanced technologies, enhancement of warehouse facilities, implementation of a warehouse management system, improved transparency, and increased use of army farm products.

Keywords: Food supply chain, Supply chain performance, Human resource issues, Technology challenges, Sri Lanka Army

INTRODUCTION

Background and Context of Food Supply Chain Management in the Sri Lanka Army

Military logistics, derived from the Greek term logistikos ("skill in calculation"), has been pivotal in warfare since antiquity, evolving through World Wars I and II to emphasize combat supplies like food, fuel, and ammunition (Barnett, 2014). Modern supply chain management (SCM) optimizes the flow of goods from raw materials to end-users, enhancing efficiency and reducing costs (Stadtler, 2008). The COVID-19 pandemic exposed critical vulnerabilities in global food supply chains, disrupting labor, production, and distribution networks. Perdana et al. (2020) identified inadequate resilience and digital infrastructure as key weaknesses, underscoring the need for real-time tracking and diversified suppliers. Supply Chain Management (SCM) refers to managing the movement of goods and services, together with all processes turning raw materials into finished products. SCM aims to maximize a firm's supply-side functions in a way that ensures ultimate customer value and competitiveness (Csordás et al., 2022). It includes controlling manufacturing, shipping, and distribution in a manner that eliminates extra costs and accelerates delivery time. The two World Wars experiences of the military placed in sharp relief the utmost significance of efficient logistics especially for war materials such as ammunition, fuel, and foodstuffs required for regular operations (Budd et al., 2017). Unlike her bordering South Asian counterparts such as India, Pakistan, and Bangladesh whose armed forces have developed their food supply chain due to enduring border confrontations the food supply chain management of Sri Lanka Army has been relatively traditional.

In pandemics such as the COVID-19 pandemic, SCM for the food sector has played a pivotal role in ensuring the availability, safety, quality, and timely supply of food. The pandemic exposed vulnerabilities in global food supply chains, emphasizing the necessity of resilience, technological integration, and diversification of suppliers (Perdana et al., 2020). The SLA, with a force of some 180,000 soldiers grouped into a number of infantry divisions, regiments, and support units, relies on its Supply and Transport Corps (SLASC) to manage critical logistics like food, transport, and fuel (Choi et al., 2020). The food supply chain includes a number of stages like bidding, procurement, storage, distribution, and service delivery, with participation by different government and military stakeholders. The COVID-19 pandemic slowed down the food supply chain around the world, inhibiting processes and economic activity,

whose economic effects include labor shortages, loss of production capacity, and interruption of supplies (Attaran, 2020; Singh et al., 2021).

Historical examples, like King Dutu Gemunu's logistics in the Mahawansa (Weissman, 2011), are far behind what the SLA has with its archaic 30-year-old rationing mechanism without the benefit of modern refrigeration, digital monitoring, and feedback mechanisms. The pandemic brought this shortcoming into focus, with resultant supply chain disruptions that impacted availability, access, utilization, and stability of pillars of food security (Laborde, 2019; Kumar,et.al., 2021).

Research Problem: Systemic Loopholes in Colombo-Based Military Food Supply Chains

Logistical efficiency is critical for the military Food Supply Chain Management (FSCM), especially during crises. Supply chain interruptions can adversely affect food quality, safety, freshness, accessibility, and price. The COVID-19 pandemic highlighted four major challenges: rising demand for functional foods, food safety concerns, immune system support, and sustainability issues (Rahman et al., 2020). Food security, comprising availability, access, use, and stability, was particularly strained during the pandemic (Moraru, 2021). Military food supply chains, which are less flexible than civilian systems due to strict regulations, faced unique challenges. The SLA continues to use rationing policies and food management methods that are over thirty years old, creating inefficiencies. Employees and stakeholders often view the bidding process as risky and unreliable. Additionally, resistance to adopting modern technologies, lack of relevant skills, and conventional mindsets hinder innovation in the SLA's food supply chain (Rahman et al., 2020). Modern military forces globally have implemented computerized supply monitoring, refrigeration storage, secure transportation, and stringent quality control, unlike the SLA's current system, which suffers from inefficient storage, delays, and administrative challenges. Human resource factors such as performance management, training, and recruitment also need improvement to ensure an efficient food supply chain (Dahanayake et al., 2018). There remains a problematic separation between food logistics and other operational sectors.

Therefore, this study aims to assess the current logistical practices of the SLA's food supply chain, identify existing loopholes, and propose strategic improvements.

Research Framework: Questions, Objectives, and Significance

a. **Research Questions.** The main research question is that, "What are the magnitudes and loopholes at various levels of management involved in the food supply chain in Colombo-based operations in the Sri Lanka Army?

b. **Primary Objective.** To evaluate the loopholes and their magnitudes within the existing food supply chain system in Colombo-based operations in the SLA.

c. **Significance.** The significance of this research lies in its potential to enhance the efficiency and sustainability of the army's food supply chain, which is critical given the substantial annual expenditure of approximately 52 billion on ration procurement and the essential role nutrition plays in soldiers' survival and performance in the field. Modern supply chain practices that improve the delivery of high-quality, nutritious food at lower costs directly impact the quality of life for troops and optimize resource utilization. Despite growing attention to sustainability in supply chain management over the past three decades, existing knowledge remains inadequate for designing truly sustainable supply chains, particularly within military logistics. Addressing this gap is crucial for stakeholders involved in the army's food supply chain to balance efficiency, nutrition, and sustainability, and to innovate beyond conventional approaches by tackling emerging challenges and trade-offs in sustainable supply chain management. This research thereby contributes valuable insights for both academic understanding and practical improvements in military food supply systems.

METHODOLOGY AND EXPERIMENTAL DESIGN

Research Design & Approach

a. **Methodology Overview.** The Sri Lankan Army food supply chain is being studied using a mixed-methods approach that combines quantitative and limited qualitative techniques (Creswell & Creswell, 2018). By gathering data primarily through quantitative surveys bolstered by qualitative interviews of senior officers, this study design takes a deductive approach to analysing theoretical hypotheses

(Saunders et al., 2019). According to Bryman (2016), a cross-sectional time period provides for rapid analysis by capturing data at a single point in time.

b. **Research Philosophy.** The research takes a pragmatic approach, acknowledging that there are several realities and that reality is contextual. Through the use of surveys and thematic interview analysis, the research enables in-depth comprehension by integrating positivist quantitative approaches and interpretivist qualitative methods (Saunders et al., 2019).

c. **Research Approach.** Based on accepted theories, a deductive method directs hypothesis testing, and qualitative theme analysis is used to delve deeper into stakeholder perspectives (Creswell & Creswell, 2018). In order to effectively handle complicated real-world problems, pragmatics encourages the employment of a combination of approaches.

d. **Sources of Data.** A qualitative theme analysis is used to probe deeper stakeholder sentiments, whereas a deductive technique directs hypothesis testing from theory (Creswell & Creswell, 2018). In order to solve complicated real-world problems as best as possible, pragmatics encourages the employment of a combination of approaches.

e. **Quantitative Data Collection.** Using self-administered Likert-scale questionnaires, distributors, suppliers, and customers were asked 30–40 questions covering five key variables in order to collect quantitative data. This approach, statistical testing, and data visualisation enable the identification of patterns (Creswell & Creswell, 2018).

f. **Qualitative Data Collection.** Due to participants' busy schedules, situational information and subjective viewpoints that could not be obtained through questionnaires were obtained through in-person interviews with senior strategic officials from AHQ using pre-formulated questions. To analyse qualitative data, thematic analysis was used (Saunders, Lewis & Thornhill, 2019).

g. **Research Strategy.** The research approach integrated field surveys to gather quantitative data and one-on-one interviews to

obtain qualitative data. Hand-delivered self-administered questionnaires were filled in by respondents, whereas interviews took 30–45 minutes, allowing for the gathering of rich data through verbal and non-verbal responses (Bryman, 2016).

h. **Time Horizon.** A cross-sectional time frame was adopted to analyze the current status of the food supply chain. This approach fits the study's goal of understanding stakeholder attitudes, performance issues, and barriers without requiring prolonged observation (Saunders et al., 2019).

Data Collection Framework

a. **Target Population: Stakeholders in SLA FSC, Colombo.** Suppliers, Distributors (SLASC personnel), Consumers (battalions and units), and Senior Strategic level decision making Officers (AHQ).

b. **Sampling: Quantitative.** Purposive sampling selecting 276 participants: 42 Suppliers, 81 Distributors, 153 Consumers. Qualitative: Purposive sampling of 10 Senior Officers (AHQ, Dte of S&T), reaching data saturation.

c. **Quantitative Data Collection Methods.** Three tailored Likert-scale questionnaires (30-40 items each) hand-delivered to Suppliers, Distributors, and Consumers. Qualitative: Face-to-face, in-depth interviews (30-45 mins) using a pre-defined guide with Senior Officers.

Analytical Framework

Conceptual Framework: Identifies 5 key independent variables impacting FSC Performance:

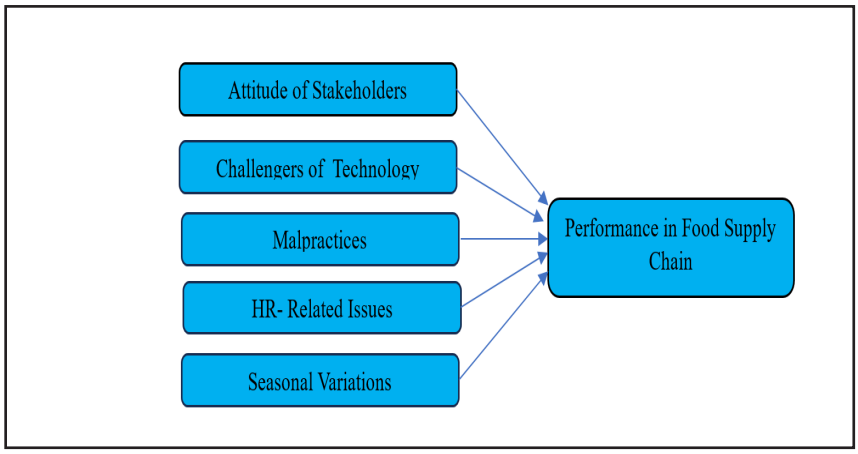

Fig 1: Conceptual Framework
Source: Developed by Researcher (2024)

Hypotheses (H1-H5): Directly test the impact of each conceptual variable on FSC Performance in SLA Colombo.

Table 1: Hypothesis Development

Name	Hypothesis
H1	Attitudes of the stakeholders has an impact on food supply chain in reference to Colombo in the SLA.
H2	Challenges in technology has an impact on food supply chain in reference to Colombo in the SLA.
H3	MP has an impact on food supply chain in reference to Colombo in the SLA.
H4	HR issues have an impact on food supply chain in reference to Colombo in the SLA.
H5	Seasonal variation has an impact on food supply chain in reference to Colombo in the SLA

Source: Developed by Researcher (2024)

Measure Validation. Reliability tested via Cronbach's Alpha (>0.7 target). KMO test (>0.8 target) for sampling adequacy before factor analysis.

Data Analysis: Quantitative (SPSS v22.0). Pearson Correlation (strength/direction of variable relationships), Linear Regression Analysis (impact of IVs on DV), ANOVA (group differences), supported by R-square (model fit). For Qualitative: Thematic Analysis of interview transcripts to identify key themes and strategic insights.

Key Elements Preserved. Pragmatic philosophy, Deductive approach, Mixed-methods (Quantitative dominant), Cross-sectional design, Purposive sampling strategy, Specific sample sizes (276 quant, 10 qual), Data collection tools (Questionnaires, Interviews), Conceptual Framework (5 variables), All 5 Hypotheses (H1-H5), Validation metrics (Cronbach's, KMO), Core statistical tests (Correlation, Regression, ANOVA), Thematic analysis.

RESULTS

Psychometric Properties and Sample Characteristics

a. **Sample Adequacy & Validity.** All stakeholder questionnaires (Suppliers, Distributors, Consumers) met Kaiser-Meyer-Olkin (KMO) thresholds (>0.5), confirming sample adequacy. Convergent Validity: Cronbach's Alpha (>0.7), Composite Reliability (>0.7), and AVE (>0.5) met benchmarks for all constructs across groups. Discriminant Validity: Fornell-Larcker criterion satisfied (√AVE > inter-construct correlations) for all variables.

b. **Reliability.** Cronbach's Alpha exceeded 0.7 for all constructs (e.g., Suppliers: AS=0.718, CIT=0.754; Consumers: SV=0.720, PFSC=0.732), confirming internal consistency.

c. **Demographics.** (N=276): Gender: Male-dominated (Suppliers: 85.7%; Distributors: 85.2%; Consumers: 82.4%). Age: Primary age groups: 26–33 (Consumers: 35.9%), 34–42 (Suppliers: 47.6%). Experience: Majority had 13–22 years (Suppliers: 71.4%; Consumers: 32.7%).

d. **Quantitative Analysis Findings.** Descriptive Statistics: Suppliers: Highest mean for Service Quality (SV=3.70); lowest for HR

Issues (3.20). Consumers: Highest mean for Attitude (AS=3.69); lowest for Performance (PFSC=2.65).

e. **Correlations: Distributors.** Strongest PFSC correlation with Attitude (AS: r=0.596, p<0.007). Consumers: SV showed the strongest PFSC link (r=0.655, p<0.00).

f. **Regression Results.** Suppliers: AS (βsig=0.022), CIT (0.037), MP (0.040), HR (0.028), and SV (0.001) significantly predicted PFSC (R^2=31.7%). Distributors: Only AS (0.039) and CIT (0.031) were significant predictors (R^2=19.8%). Consumers: AS (0.005) and SV (0.040) drove PFSC (R^2=45.8%). All hypotheses (e.g., AS→PFSC, SV→PFSC) were accepted (p<0.05).

Qualitative Insights (N=10 Senior Managers)

a. **Thematic Analysis Attitudes.** Stakeholder risk aversion impacts supply chain decisions; accountability is critical (5/10 respondents). Technology: AI/IoT adoption needed for efficiency; 70% emphasized training alongside tech upgrades. Malpractices: Fraud and documentation gaps require audits + tech integration (6/10 recommended). HR Issues: Mixed views: 60% cited effective policies; 40% noted recruitment/stress challenges. Seasonal Variations: Unanimously deemed irrelevant, military supply chains operate irrespective of season. Performance: Resilience (6/10) and staff training (3/10) are key to maintaining PFSC.

DISCUSSION AND CONCLUSION

Key Findings

a. **Quantitative Findings.** Stakeholder attitudes (AS) and food supply chain performance were found to be positively correlated by the quantitative analysis, and suppliers, distributors, and consumers all attested to the fact that responsibility and collaboration boost productivity. Performance was adversely affected by technology difficulties (CIT), as limited technical knowledge and insufficient digital integration made it difficult to respond. Malpractices (MP) caused unethical behaviour and a lack of transparency, which immediately decreased operational reliability and trust. Staff

shortages (particularly among suppliers), training gaps, and job stress have been identified as major human resource bottlenecks that reduce productivity. According to stakeholders, supply chain stability was impacted by disruptions, and seasonal variations (SV) were statistically significant.

b. **Qualitative Findings.** Qualitative observations revealed minor challenges: Five administrators opposed attitude adjustments because of ingrained reluctance, citing organisational inertia, even though stakeholder attitudes (AS) were appreciated for improving governance. AI, IoT, and cloud integration were crucial for real-time monitoring and resilience, according to Technology Gaps (CIT). Malpractices (MP) required stringent audits and blockchain documentation due to the disastrous outcomes that endangered military health, morale, and financial efficiency. HR issues include hiring difficulties, work-related stress, and inadequate training, as well as requests for competitive pay and skill-building initiatives. Interestingly, every official denied the effects of seasonal variations (SV), pointing to effective mitigation techniques (e.g., multiple source, storage).

c. **Critical Contrast.** A key divergence emerged in seasonal variations (SV): Quantitative data indicated a significant impact (supporting H5), but qualitative evidence unanimously showed existing systems neutralized seasonal effects. This contradiction suggests stakeholder perceptions in surveys (quantitative) reflected potential concerns, while operational realities (qualitative) demonstrated effective mitigation. Consequently, SV was deemed irrelevant for future analysis. Both methods consistently identified technology gaps, malpractices, and HR issues as primary barriers, though qualitative insights exposed deeper operational resistance and systemic flaws in addressing these challenges.

CONCLUSIONS

Quantitative Study: Confirmed all factors (attitudes, tech issues, malpractices, HR issues, seasonal variations) affect supply chain performance, with HR issues being supplier-centric.

Qualitative Study: Stakeholder attitudes and tech gaps are critical barriers.

Malpractices require strict governance (audits, transparency). HR challenges demand targeted recruitment, training, and stress management. Seasonal variations are effectively mitigated by existing systems, suggesting exclusion from future analyses. Overall: Addressing attitudes, tech, malpractices, and HR can enhance efficiency, reliability, and service delivery.

Recommendations & Research Implications

Operational Improvements: Technology Integration: Adopt AI/ML, IoT, blockchain, and cloud computing for real-time tracking, demand forecasting, and tamper-proof documentation. HR Management: Enhance recruitment, offer competitive pay, stress support, and comprehensive training programs.

Governance & Logistics: Modernize warehouses and maintain 2-month emergency reserves. Implement strict audits, reduce procurement surplus from 10% to 5%, and ensure timely supplier payments. Establish direct procurement from army farms/local producers to cut costs.

Research Limitations & Future Directions

Limitations: Geographically restricted to Colombo AOR; excluded managerial perspectives; limited sample diversity.

Future Research:Expand studies nationwide (beyond Colombo) and include managerial staff. Conduct in-depth qualitative work (e.g., focus groups) on supply chain loopholes. Explore technology adoption barriers and HR policy standardization.

ACKNOWLEDGEMENT AND REFERENCES

Acknowledgement

Sincere appreciation is extended to Senior Professor of the Faculty of Management Studies, Rajarata University of Sri Lanka, for his invaluable guidance and continuous support. Gratitude is also conveyed to all lecturers of the MBA program for their academic contributions. The support of visiting academics from other institutions is also gratefully acknowledged.

REFERENCES

Attaran, M (2020) Digital technology enablers and their implications for SCM. Supply Chain Forum: An International Journal, 21(3), 158–172.

Barnett, M (2014) British food policy during the First World War (RLE The First World War). Routledge.

Bryman, A and Allen, T (2011) Education research methods. Oxford: Oxford University Press.

Budd, N, Jeffries, J.K and Jones-Smith, J et al. (2017) Store-directed price promotions and communications strategies improve healthier food supply and demand: Impact results from a randomized controlled, Baltimore City store-intervention trial. Public Health Nutrition, 20(18), 3349–3359.

Choi, T.M, Guo, S and Luo, S (2020) When blockchain meets social media: Will the result benefit social media analytics for supply chain operations management? Transportation Research Part E: Logistics and Transportation Review, 135, 101860.

Csordás, A, Lengyel, P and Füzesi, I (2022) Who prefers regional products? A systematic literature review of consumer characteristics and attitudes in short food supply chains. Sustainability, 14(15), 8990.

Dahanayake, A.P (2018) Assessing and minimizing the wastages in perishable cargo: Case of vegetables supply chain in Sri Lanka (Doctoral dissertation).

Dahanayake, N.D and Gamlath, S (2013) Learning organization dimensions of the Sri Lanka Army. The Learning Organization, 20(3), 195–215.

Kumar, A, Mangla, S.K and Kumar, P et al. (2021) Mitigate risks in perishable food supply chains: Learning from COVID-19. Technological Forecasting and Social Change, 166, 12064.

Moraru, C.A (2021) The influence of national support conditions on multinational interrelationation and interoperability in NATO coalition. Scientific Research & Education in the Air Force.

Perdana, T, Chaerani, D and Achmad, A.L.H et al. (2020) Scenarios for handling the impact of COVID-19 based on food supply network through regional food hubs under uncertainty. Heliyon, 6(10), e05128.

Rahman, C.F, Sharun, K and Jose, B et al. (2020) COVID-19 and food safety: Implications and opportunities to improve the food supply chain. Journal of Experimental Biology and Agricultural Sciences, 8(Special Issue 1), S34–S41.

Saunders, M, Lewis, P and Thornhill, A (2019) Research methods for business students. 8th ed. London: Pearson.

Singh, S, Kumar, R and Panchal, R et al. (2021) Impact of COVID-19 on logistics systems

and disruptions in food supply chain. International Journal of Production Research, 59(7), pp.1993–2008.

Stadtler, H (2008) SCM—An overview. SCM and Advanced Planning, pp.9–36.

Weissman, F (2011) Sri Lanka: Amid all-out war. In: Humanitarian negotiations revealed: The MSF experience. pp.14–33.

UNLOCKING AERIAL ACCESS: THE STRATEGIC ROLE OF MILITARY AIRSTRIPS IN BOOSTING REGIONAL TOURIST MOBILITY IN SRI LANKA

Major RADC Ranasinghe SLLI
Sri Lanka Army

ABSTRACT

Because of the limited access to the region and the poor transportation infrastructure of the area, the region of Trincomalee with its agritourism potential and diverse cultural heritage remains underdeveloped in the tourism sector. High ranking military air strip potential dual functionality: China Bay military air strip can serve in this capacity both as a defence capability to the country and the region; and, tourist destination to the region. The research examines how stakeholders view the conversion process of the air strip into limited civilian aviation facilities while assessing its readiness and policy frameworks and strategic possibilities. The research data was obtained through semi-structured interviews and focus group discussions and secondary document analysis of key informants who included Sri Lanka AirForce personnel and representatives from the Civil Aviation Authority and tourism professionals and local community members. The study reveals that all stakeholders support using the airstrip for tourism mobility because they see advantages in shorter travel times and increased tourist numbers and economic growth. The ongoing operational control issues and airspace security problems and regulatory uncertainty continue to exist. The China Bay airstrip demonstrates substantial untapped potential to function as a regional mobility hub according to the research findings. The potential of this site can be unlocked through strategic civil-military coordination and supportive policies and inclusive planning that protect national interests. In the paper, a phased implementation has been proposed following the security protocols and that support sustainable tourism objectives and the community participation strategies.

Keywords: China Bay airstrip, Trincomalee tourism, Dual-use infrastructure, Civil-Military coordination

INTRODUCTION

Trincomalee, which is located on the East coast of Sri Lanka, is a region endowed with excellent natural beauty, rich history and profound cultural

heritage. Fonseka and Raheem (2009) highlight that Trincomalee is home to world renowned attractions such as Nilaveli Beach, Pigeon Island National Park, the ancient Koneswaran Temple and the Trincomalee Harbor, which is one of the finest natural deep water ports in the world. Despite these attributes, Hewawasam (2024) confirms that Trincomalee has not reached its full potential as a tourist attraction, primarily due to a deficiency of transport infrastructure and connectivity to the principal urban centres like Colombo and Kandy.

A key limitation to the growth of tourism in Trincomalee is inaccessibility. Don (2021) explains that although the region is linked by road and rail, the travel duration from the southern and western parts of the country are long and inaccessible, particularly for international tourists with time constraints. Although the China Bay airstrip run by the Sri Lanka Air Force (SLAF) is available in close distance to the city, it is currently restricted to military purposes with limited and well-controlled civilian functions. Its geography and being very near the tourist areas of attraction as well as the already existing aviation infrastructure makes a strong argument that it should also be included in the tourism regional mobility network.

Nandy and Naha (2023) write about how civil-military dual use of airstrips has been an effective cost-saving way of enhancing regional connectivity without building new infrastructure from scratch. Asian Development Bank (2021) informs that India, Indonesia and Thailand have successfully employed identical models to open remote or strategic locations for tourism and economic development. But in Sri Lanka, while the concept is underdeveloped but limited air access, this study seeks to establish the feasibility of opening aerial access through the use of the China Bay military airstrip.

Isolated analysis and policy-oriented evaluation of the common use concept of military airfields as tourism facilities, more so in the place like Trincomalee which is ready to be developed but constrained by access inhibitors is the name of the research gap. Neither current tourism policy and infrastructure development plans nor civil-military aviation integration and the strategic reuse of available military assets for national development objectives are considered to any significant degree.

This study will focus on critically reviewing how the China Bay military airstrip will help in tourist movement and area development in the city of Trincomalee. The researchers are focused on exploring the attitudes of the main stakeholders, the facilities infrastructural preparedness of the airstrip,

policy and regulatory issues and the general implication of the integration of the facility into civilian tourist operation in economic and social terms. The study aims to evaluate the level of readiness of China Bay military airstrip to support domestic tourism, to study the perspective of stakeholder representations of military tourism, civil aviation, local government and the community on the opportunity of duel use operations, regulatory, security and operational concerns in the propagation of part of the airstrip as civilian use as well as recommendation of directions of strategic policies and infrastructural modifications towards enabling air accessibility of the region at Trincomalee.

This research contributes to the broader scholarship of sustainable regional development and strategic assets use by proposing a localized, realistic development and strategic assets use by proposing a localized model of civil-military integration. With its focus on Trincomalee, it provides context-specific suggestions that can inform national tourism planning, defence policy reform and inclusive infrastructure development.

METHODOLOGY AND EXPERIMENTAL DESIGN

The research is carried out in Trincomalee District where the field aspect of the research is highly concentrated around the China Bay Airstrip and around the locality of Nilaveli, Uppuveli and Trincomalee town center. The study carries the dynamics of how the opening of aerial access via the China Bay facilitate under the management of the military in supporting the ultimate growth of tourism, enhancing better connectivity within the region and boost the local economy.

a. **Methods of Collecting Data.** The qualitative data will be collected via three key methods which are the Semi Structured Interviews with senior officers of SLAF at China Bay, the officers of Ministry of Tourism, Sri Lanka Tourism Department Authority (SLTDA) or the Civil Aviation Authority of Sri Lanka (CAASL), the officials of the Local Government at Trincomalee Municipal Council, tour guides and hotel managers of the area, through Focus Group Discussions (FGDs), and the Document Analysis.

b. **Sampling Strategy.** To have representation of key stakeholder groups, a purposive sampling technique is employed. The sample is composed of around 20-25 people where there is fair representation of members who are associated with the military,

tourism, civil aviation and community. The participants will be identified by their roles, expertise and place near the airstrip or the tourism related operations in Trincomalee.

c. **Analysis of Data.** A manual coding process is used to carry out the thematic analysis, in which line-by-line coding of interview and FGD transcripts is carried out. Areas of emergent themes are infrastructure and operational capacity of the airstrip, military concerns and security protocols, regulatory readiness and inter-agency coordination, local community expectations and development outlook and opportunities of public-private partnership. The credibility is assured in triangulation of date across the sources, whereas having member checks (confirming the findings with the key informants) serves to ensure reliability.

d. **Concept of Ethics.** Ethical authorization of the concerned academic institution is given. Informed consent is used by all participants and interviews are anonymized in order to satisfy the intended confidentiality, especially in case of military and the government respondents. Attention is paid to those "classified" or sensitive materials that may risk the national security.

e. **Limitations.** Although the study paints a detailed picture of the potential of China Bay, it has only given specific cases, one site, which may restrict its generalizability in the other military airports in Sri Lanka. Nevertheless, its results provide a useful model of localised policy development and international comparison in the future.

RESULTS

This chapter is the presentation of the outcome of field interview, focused group discussion, and document analysis about the opportunity of incorporating China Bay airstrip into the regional tourism of Trincomalee. Through thematic analysis, five dimensions were identified: infrastructural readiness, military concerns, regulatory gaps, stakeholder interest and community expectations.

a. **Infrastructural Readiness.** Analysis of interviews with SLAF officers and tourism infrastructure planners also indicated that the China Bay airstrip has low level operating capabilities that could

be used to accommodate civilian turboprop planes like Twin Otter or Cessna Caravan. The runway, which is 1,800 meters, is properly maintained with the landing aids being visual and there is a perimeter security system. However, it lacks a civilian terminal, fuel supply chain, or customs/immigration infrastructure dealing with the incoming charter traffic of foreign countries.

b. **Military Discussions and Operational Safety.** The officers of the SLAF stated the intention to support dual-use arrangements in case of conditions being attached. They were primarily worried about the need to maintain rapid response capabilities, unauthorized access to sensitive installations and airspace time conflicts. The proposal involves a closed civilian window, separate passenger entry points, and seasonal chartered flights as opposed to f ull-integration into civilian traffic. It was also indicated necessity of Memorandum of Understanding (MoU) that gives the command authority and the clause on liability.

c. **Regulatory and Institutional Gaps.** The interviewees at the CAASL and the Ministry of Defence revealed that there is no guiding policy on how military airstrips can be used to serve the dual purpose. Although there have been precedents, like Palay Airport in Jaffna, there is no formal Standard Operating Procedure (SOP) in place in the case of long term tourism integration. The question of licensing, insurance, who is responsible to perform maintenance and how to coordinate air traffic control has always posed a problem.

d. **Stakeholder Interest in Ariel Access.** The tourism operators and owners of hotels gave a rousing welcome to the concept of aerial access since they pointed out that the road travel duration (6-7 hours) to Colombo was one of the reasons preventing high spending tourists. They presented an argument that the transformation of China Bay as a facility that is compatible with the tourist coastal needs could enhance a higher influx of the tourists, attracting short-stay packages (2-3 nights), promote the generation of revenues and job creators within the region. There are even case-based co-investment offers by some of the stakeholders in basic infrastructure and Public-Private Partnerships (PPP), especially in a modular passenger terminal and shuttle services. Table 1 explains the overview of the views of the stakeholders to China Bay airstrip.

Table 1: The Summary of Stakeholder Perspectives on China Bay Airstrip

Stakeholder Group	Perspective	Key Concerns
SLAF China Bay Base	Cautious support	Limited access
		Maintain operational control
CAASL and MOD	Acknowledge feasibility	Absence of SOP
SLTDA and MOD	Need Legal clarity	Need regulatory reform
	Supportive of tourism integration	Require policy directive
		PPP friendly framework
Tour Operators	Strongly supportive	Advocate for weakened flight schedule

Source: The Author Developed Based on the Results

e. **Community Expectations and Concerns.** Apositive attitude was displayed in the focus group discussion carried out in Nilaveli and Uppuveli by small business owners and residents. It was believed that aerial access enhanced local employment in the form of the creation of jobs, access to the market with handicrafts and produce, and increased visibility at the regional level. They were worried that they could lose land or be displaced, be exposed to noise in their own areas, and be exposed to environment hazards.

China Bay airstrip is structurally fit to be used in dual purpose in terms of roads but not adequate in the grounds to serve tourism. Reuse of the SLAF is restricted to civilian utilization, albeit under heavily regulated conditions and the lack of regulatory framework forms a major institutional problem. Moreover, there exists strong stakeholder support including that of the tourism and the local governments, and the community at large is in general positive in regard to inclusions and sustainability. The result shows that the phased, consultative and policy-based results, may see the China Bay airstrip becoming a strategic hub that will support more aerial tourism-related opportunities to Trincomalee.

DISCUSSION

The above research discovery sheds light on the opportunities and confounding issues pertaining to the use of China Bay military airstrip as a strategic facilitator of regional tourism in Trincomalee. Being strategically located near a major tourist attraction like Nilaveli beach and Koneswaram Temple as well

as Pigeon Island it is a geographically strategic assets the underutilization of which is symbolic of the lack of coordination between national defence assets and the plans to develop the region. Both SLAF official and tourism planers confirm that the physical and operational preparedness of the airstrip is in tandem with theory of infrastructure repurposing in regional sustainable development. The fact that its 1,800 meters paved, runway clear line of access and the fact that it operates all year round implies that it would take a minimal investment to enable it to limit civilian integration. This can be economically favored as far as logistical view is concerned so as to establish a new local airport within the post conflict area where there is a limit of money to develop this region.

However, the biggest disadvantage is institutional resistance. According to the interviews, there were no formal civil military aviation policies and regulation vacuum in the duel-use operation. This is similar to the ending of the local study in India and Indonesia where the duel-use airports was not possible until the periods of legal changes and new centralized control units establishment. Therefore, CAASL and MOD have the mandate to collaborate in the formulation of SOP, which would take control of the air traffic controls, air security controls, insurance and the maintenance of infrastructure. Lack of these structures can lead to delays in operations or quibbles in trying to incorporate the civilians through the laws.

In the military sense, the fact that SLAF is willing to but at certain terms implies an increased willingness to collaborate with civilians, as long as it does not negatively affect the fundamental defence capabilities. They proposed the allocation of certain flight window in order to minimize delays, separate civilian entrances, and restricted access into the specified area, which is a strategic compromise. This is in tandem with the international doctrine of controlled civil use that has effectively been put in application on duel use airstrip like Jaisalmer on India and Subang in Malaysia.

The high interest received among the tourism stakeholders testifies to the high unstructured demand of direct air access to Trincomalee. Tour operators would always give reasons that road travel time between Colombo and other parts of Sri Lanka was too long (6-7 hours) and this discouraged inbound tourist particularly those on short trips. Through this possibility of 45 minutes charter flight between Colomo and China Bay, Trincomalee has the opportunity to tap into a new market of high value travelers such as wellness tourists, cruising tourists on fly-in products and diving guests to Pigeon Island. It is particularly

interesting that the tour operators and the managers of the hotels are keen on using PPPs to co-invest in the development of the terminals. It indicates that the private sector is willing to supplement the public infrastructure with facilities that offer the services such as modern terminals, lounge area and shuttle connectivity.

The results of the community focus groups are also equally important. The favorable prospects of residents of Nilaveli and Uppuveli in connection with Ariel access are associated with the positive economic effects related to enhanced employment opportunities, greater exposure in the region and market access. Nonetheless, issues like noise pollution, eviction and environmental displacement fuel the interests in comprehensive planning. This resonates with the aspects related to sustainable tourism development whereby it is important that the development of the infrastructure should be environmentally friendly and socially acceptable. Local consultations and community benefit a sharing mechanisms and Environmental Impact assessments (EIAs) should become conditional parts of any development formwork that includes China Bay.

All in all, the outcomes articulate a potential intersection between strategic opportunity, stakeholders interest and popular backing, although there is a need of strong policy framing and institutional coordination transparency to make it effective. Could the unlocking of the China Bay serve as a pattern for dual use transformation of airstrips in Sri Lanka to spread tourism, to provide a boost in the other post-war economic sector of Trincomalee District and that too by making use of optimized national asset at rates which need not impact on defence-readiness.

To sum up, the incorporation of China Bay airstrip into the tourism system of Sri Lanka is a good opportunities. But success can only be defended, not just on the infrastructure adaption but also on the specific synchronization of the policies, stakeholder and sustainable development goals.

CONCLUSION

This paper has examined the strategic viability of reusing the Chinabay military airstrip at Trincomalee to help increase the tourist mobility in the region. It can be found in the findings that; the airstrip as much as it has very good operational capacity; geographical advantage and unusually low isostructural gaps that can be utilized by civilians. It has potential that is yet to be fully harnessed because of the institutional regulatory and policy related limits.

The study illustrates the existence of a high level of agreement amongst main stakeholders, tourism operators, local communities and a few defence officials the usefulness of opening up the aerial access to Trincomalee port as a driver of economic growth of the region, diversification of tourism, and improvement in connectivity.

In the perspective of national development, the inclusion of the China Bay into the civil aviation network in Sri Lanka, may facilitate the decentralization of tourism industry out of Colombo and the south of the country, resulting in the balanced dispersion of the tourism revenue. A shorter travel would reduce the burden on the tourists and the local economy would experience the boost of employment incentives, footfall and investments in the transport and hospitality service sections of the local economy. However, the effectiveness of such incorporation lies on a very thin line between national security and development desire. The lack of transparency of dual-use aviation policy framework, operational guidelines and regulation is one of its key challenges. Besides, the process should operate on principles of environmental sustainability and local inclusion given the sensitivity of Trincomalee with regards to the socio-environmental position of the region.

To sum up, the China Bay airstrip is not only a runway, but an underdeveloped national resource that would bring a paradigm shift. The discovery of how its extensive storage facilities can be unlocked into serving limited civilian purpose, in a safe and controlled environment, could be used as foundation to a larger plan to transform Trincomalee into the vibrant gateway of tourism. To achieve this vision in a long-lasting and safe way, strategic cooperation between the Sri Lanka Air Force (SLAF), the civil aviation authorities, tourism planners, and the community that lives in the area is required.

REFERENCES

Abeyrathna, G.R.T.B. (2024) 'Navigating the Future: Innovations and sustainability in supply Chain Management- Introducing a Warehouse to Trincomalee Harbour', Research Symposium on Supply Chain management & Logistics, Colombo, 28 February. Colombo: NationalInstitute of Business Management, pp. 1-

Asian Development Bank (2021) National Port Master Plan: Technical Assistance Completion Report. Project Number 50184-001. Manila: Asian

Development Bank. Available at: https://www.adb.org/sites/default/files/project-documents/50184/50184-001-tacr-en_17.pdf (Accessed: 7 July 2025).

Attride-Stirling, J., (2001) Thematic Networks: An Analytic Tool for Qualitative Research. Qualitative Research, 1(3), pp. 385-405. Available at: https://journals.sagepub.com/doi/10.1177/146879410100100307 (Accessed: 8 July 2025).

Beurskens, K.R. (ed) (2019) The Long Haul: Historical Case Studies of Sustainment in Large Scale Combat Operations. Fort Leavenworth, KS: Army University Press. Available at: https://www.armyupress.army.mil/Portals/7/combat-studies-institute/csi-books/the-long-haul-lsco-volume-4.pdf (Accessed: 7 July 2025).

Braun, V. and Clarke, V., 2006. Using thematic analysis in psychology. Qualitative Research in Psychology, 3 (2), pp.77-101. Available at: https://www.tandfonline.com/doi/abs/10.1191/1478088706qp063oa (Accessed: 7 July 2025).

Center for Army Lessons Learned, 2022. Sustainament in Support of Large Scale Combat Operations (#22-657). For Irwin, CA: U.S. Army Center fro Army Lessons Learned. Available at: https://www.army.mil/article/258366/22_657_sustainment_in_support_of_large_scale_combat_operations

Consortium of South Asian Think Tanks (COSATT) Security and Economic Challenges in the Indo-Pacific. Kathmandu: Book- Hill Publication Pvt. Ltd. Available at: https://www.cosatt.org/images/news/file/FInal%20Indo-Pacific%20Book_20210101123626.pdf (Accessed: 9 July 2025).
Defence and Strategic Studies Sessions (2024) Proceedings of the 17th Defence and Strategic Studies Forum. General Sir John Kotelawala Defence University. Available at: https://ir.kdu.ac.lk/handle/345/8564 (Accessed: 7 July 2025).

Department of Defence, (2010) Irregular Warfare: Counting Irregular Threats – Joint Operating Concept, Version 2.0. Suffolk, VA: United States Joint Forces Command, Joint Futurees Group. Available at: https://apps.dtic.mil/sti/pdfs/ADA522763.pdf (Accessed: 10 July 2025).

*Don, J. (2021) 'Military Logistics Management Problems in Rural Areas in Sri Lanka', Research Gate. Available at: https://www.academia.edu/38005898/MILITARY_LOGISTICS_MANAGEMENT_PROBLEMS_IN_RURAL_*

AREAS_IN_SRI_LANKA_A_CASE_STUDY_ON_TRANSPORTATION_ISSUES_FACED_BY_22_DIVISION_DEPLOYED_IN_TRINCOMALEE (Accessed: 10 July 2025).

Fernando, W.C.M. et al., (2023). Origin and Mineralogy of Gem and Rare Earth Element Bearing Gravels in Eheliyagoda, Sri Lanka. In: 14th Annual Science Research Sessions 2023, Faculty of Applied Sciences, South Eastern University of Sri Lanka, Samanthurai, SEUSL. Available at: http://ir.lib.seu.ac.lk/handle/123456789/6991 (Accessed: 7 July 2025).

Fennigan, C. (2019) 'South Asia's Logistical Hub: Challenges and Opportunities for Sri lanka's Transshipment Future', South Asia @ LSE, Available at: https://blogs.lse.ac.uk/southasia/2019/06/21/south-asias-logistics-hub-challenges-and-opportunities-for-sri-lankas-transshipment-future/ (Accessed: 13 July 2025).

Fonseka, B. and Raheem, M. (2009) Trincomalee High Security Zone and Special Economic Zone. Colombo: Centre for Policy Alternatives.Available,at:https://cpalanka.org/wpcontent/uploads/2009/11/Trincomalee%20High%20Security%20Zone%20and%20Special%20Economic%20Zone.pdf (Accessed: 7 July 2025).

Global Sustainable Tourism Council (GSTC), (2024) Global Sustainable Tourism Council (CSTC) Available at: https://www.gstc.org/ (Accessed: 13 July 2025).

Government of Sri Lanka, Department of Census and Statistics (2024) Statistical Abstract 2024- Chapter 17: Tourism (Table 17.4) Available at: https://www.statistics.gov.lk/#gsc.tab=0 (Accessed: 11 July 2025).

Hewawasam, P. (2024) Sri Lanka's Logistics and Maritime Transport Sector amidst the Polycrisis. UNCTAD Multi-year Expert Meeting on Transport, Trade Logistics and Trade Facilitation, 11th Session, 23-24 October. Geneva: UNCTAD. Available at: https://unctad.org/system/files/non-official-document/cimem7-2024-c03srilanka_en.pdf (Accessed: 12 July 2025).

Institute of National Security Studies Sri Lanka (INSSSL) (2021) Defence Review 2020, Volume III. Colombo: INSSSL. Available at: https://www.inss.lk/assets/images/publication/other/images/2021/january/2021_01_27/Defence Review_compressed.pdf (Accessed: 7 July 2025).

International Transport Forum/OECD (2024) Urban Logistics hubs, ITF Roundtable Report No. 195. Paris: OECD Publishing. Available at: https://www.itf-oecd.org/sites/default/files/docs/urban-logistics-hubs.pdf (Accessed:11 July 2025).

Jayawardena, W.R.D., (2020) Civil Military Relations: A Case Study of Sri Lanka. MSc in Security and Strategic Studies Dissertation, Sir John Kotelawala Defence University, Colombo. Available at: http://ir.kdu.ac.lk/handle/345/4301 (Accessed: 10 July 2025).

Nandy, D. and Naha, A (2023) 'Strategic Significance of Sri Lanka in India's Indian Ocean Approach', Indian Study Review, 3 (2), pp. 6382. Available at:https://www.researchgate.net/publication/381843623_Strategic_Significance_of_Sri_Lanka_in_India's_Indian_Ocean_Approach_Indian_Studies_Review_3_2_2023_pp_63-82 (Accessed: 12 July 2025).

Naval and Maritime academy (2024) LLMC Journal: Journal of Logistics Conference 2024, Trincomalee, 8 June 2024. Tricomalee: naval and Maritime Academy. Available at: https://nma.navy.lk/wp-content/uploads/2024/06/LLMC-Journal-2024-1.pdf (Accessed: 10 July 2025).

Perera, S. (2023) 'Small Nations, Big Impact: The Significance of Sri Lanka's Strategic Position in Indian Ocean Trade and Geopolitics', Research Gate, Available at: https://www.researchgate.net/publication/393170812_ Small_Nations_Big_Impact_The_Significance_of_Sri_Lanka's_Strategic_Position_in_Indian_Ocean_Trade_and_Geopolitics (Accessed: 8 July 2025).

Raska, M. (2019) 'Strategic Competition and Future Conflicts in the Indo-Pacific Region', Journal of Indo-Pacific Affairs, 2 (2) Summer. Maxwell AFB, AL: Air University Press. Available at: https://www.airuniversity.af.edu/Portals/ 10/JIPA/journals/Volume-02_Issue-2/06-Raska.pdf (Accessed: 12 July 2025).

Rogers, M.B., McConnell, B.M., Hodgson, T.J., Kay, M.G., King, R.E., Parlier, G.H. and Thoney Barletta, K. (2018) 'A Military Logistics Network Planning System', Military Operations Research, 23 (4), pp. 5-24. Available at: https://www.researchgate.net/publication/330204842_A_Military_Logistics_Network_Planning_System (Accessed: 10 July 2025).

Samarajiva, R. (2017) 'Pre-conditions for the success of Trincomalee as a transport and Logistics Hub Serving the Bay of Bengal', in Trincomalee Consultations: Regional Cooperation for Economic Prosperity and Maritime

Security in the Bay of Bengal, pp. 60-71. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3667435 (Accessed: 11 July 2025).

IMPROVING THE EFFICIENCY OF LAST MILE HUMANITARIAN LOGISTICS OPERATIONS DURING FLOOD DISASTERS IN MATARA DISTRICT

Lt Col JR Kulasiri SLEME
Sri Lanka Army

ABSTRACT

This study is focused on improving the efficiency of last mile humanitarian logistics operations during flood situations in Matara district. It is a well-known fact Matara district one of the worst affected districts from recent flood situations in Sri Lanka. Especially, flooding becomes a routine experience of the people dwelling in Matara district. Hence, it is a timely requirement that a proper relief mechanism to be established in the district whilst taking measures for the prevention of flooding. This study mainly focused on few objectives, especially identifying the critical factors which affect the efficiency of the humanitarian logistics operation and provide recommendations for improving the efficiency of the relief operations. Due to the fact that the last mile delivery plays an important role in the humanitarian supply chain, it was decided to obtain inputs from the Grama Seva Officials to conduct the research as these officials are the ground level administrators in the relief operations. Quantitative analysis was followed subsequent to obtaining data from a self-administered questionnaire distributed among 96 respondents and evaluated the questionnaire through seven variables. SPSS platform was used to conduct the data analysis and identified the critical factors which have made a tremendous impact towards the efficiency of the humanitarian logistics operations. The limitations identified in this study point toward the need for future research that expands the sample size, incorporates longitudinal data, and integrates qualitative insights. By doing so, subsequent studies can validate the findings presented here and contribute to the development of best practices in humanitarian logistics which is critically important for mitigating the adverse impacts of natural disasters. The findings reveal that while several aspects such as infrastructure, human resource, and information flow are relatively strong, there are critical gaps, especially in the areas of emergency air support, timely consignment arrivals, and financial transparency, that need to be addressed.

Keywords: Humanitarian logistics, Flood disaster, Matara district, Disaster relief, Improving efficiency, Last mile distribution

INTRODUCTION

Sri Lanka being an island in the Indian ocean, has been subjected to weather related hazards due to her location in the path of two monsoons. Apart from the climatic influences and other natural calamities, the country has experienced various man - made disasters too.

Last mile logistics operations deal with the final delivery of relief requirements and services to the affected people. In any disaster situations, the most critical stage is the last mile delivery whereas failure of this segment affects the overall effectiveness of the entire humanitarian logistics process. Last mile logistics operations are the most difficult part of the disaster management process as it needs sound information flow, involving of the human resource in adequate manner, fast delivery of logistics requirement to the end consumers and ensuring the security of both human and logistics resources.

The preparedness of Sri Lanka for natural disasters was heavily subjected to arguments after suffering from devastated Tsunami in year 2004. After that, the governments and Non-Governmental Organizations (NGOs) initiated various programmes to prepare for the disasters. However, the preparedness was not the only solution to defend from natural disasters. It is required to explore the possibilities to mitigate the natural disasters which is an effective way to ensure the safety of people and properties.

.

The purpose of humanitarian relief chain is to rapidly provide the appropriate emergency supplies to people affected by disasters and thereby minimize human suffering and death. It is a common incident that after any natural disaster government, public and other organizations individually or sometimes as a group launch humanitarian relief activity. The last mile relief distribution is the ultimate connector of humanitarian sector with the beneficiaries. It is necessary to analyze whether these relief activities are efficiently launched in order to ensure that the relief mechanism is focused the right person in right place at right time with right requirements.

Significance of the Study

Matara district is one of the worst affected districts from recent flood situations in Sri Lanka. Especially, the last flood situations occurred in May 2017 and 2023 brought lot of damages to the public and properties as well. The flood in May 2017, 2019 and 2023 is considered as the most severe flood situations during recent past.

The geographical features of the Matara District provide a conducive environment for even a small flood to spread over the area. Due to the Nilwala basin and low-lying grounds in the district, relief personnel find difficulties due to poor accessibility to affected areas. Since the main control hub, which is the Matara town is heavily prone to quick flood situations, the coordination activities could not be done as per the accepted level.

The problems faced by relief personnel are mainly due to the difficulties in distribution of items and inadequacy of relief items to fulfill the daily demands during the first few days aftermath of the disaster occurrence. Hence, it is important to identify the lapses of last mile logistics mechanism in order to enhance the effectiveness of the system which finally makes benefits to the millions of people who are regularly subjected to sudden flood situations in Sri Lanka.

LITERATURE REVIEW

Emergency Logistics Requirements During Disaster Situations

Humanitarian or emergency supplies are those goods, materials, and equipment used by organizations to provide relief in a disaster, particularly those required to meet the essential needs of the affected population (Crisis.med.uoa.gr,2018). Emergency supplies cover a large spectrum of items, from food, drugs, and clothing to rescue equipment, electric generators, construction materials, and tools. Especially, following a disaster, the most critical health supplies are those needed for treating casualties and preventing the spread of communicable diseases.

Humanitarian Logistics Operations During Disasters

Logistics is the most important element in any disaster relief effort, and it is the one that makes the difference between a successful and a failed operation (Van Wassenhove, 2006). It is also the most expensive part of any disaster relief and has been estimated that logistics accounts for about 80 % of the total costs in disaster relief (Christopher and Tatham, 2011).

Humanitarian logistics can be defined as the process of planning, implementing and controlling the efficient, cost-effective flow and storage of goods and materials, as well as related information, from the point of origin to the point of consumption for the purpose of alleviating the suffering of vulnerable people.

Humanitarian logistics is a branch of logistics dealing with the preparedness and response phases of a disaster management system (Farhani, Rezapour, Kadar, 2011). However, as per (Spriger.com, 2012) the humanitarian logistics operation involves in preparedness, recovery and response phases. After analyzing the involvement of humanitarian logistics in natural disasters it can be identified that this involves in preparedness, recovery and response stages.

Planning and anticipation are vital to an effective logistical system. The plan must be based on a good working knowledge of the geographical, social, political and physical characteristics of the area where the operations are to take place. Such a plan must not only be well thought out in advance, so that it can run smoothly it must, above all, be clearly understood and accepted by all stakeholders in any future relief operation (Spriger.com, 2012).

Disaster Relief Mechanism in Sri Lanka

The National Council for Disaster Management (NCDM) is the supreme body for disaster management in Sri Lanka. H.E. the President is the Chairperson of the National Council and Hon. Prime Minister is the Vice-Chairman of the NCDM. Ministry of Disaster Management formulate strategic decisions under the purview of NCDM.

Following institutes are functioning under the Ministry of Disaster Management in order to operationalize the disaster management activities (Disastermin.gov.lk, 2017):

a. Disaster Management Centre (DMC).
b. National Disaster Relief Service Centre (NDRSC).
c. National Building Research Organization (NBRO).
d. Department of Meteorology.

The disaster management of Sri Lanka is an integrated mechanism which incorporated disaster mitigation and disaster relief. Under the operational supervision of DMC, entire disaster management of the county is functioning.

Last Mile Humanitarian Logistics Operation

The Last mile relief distribution is the ultimate stage of humanitarian supply chain. It refers to supply of the relief items from the local distribution centres to the disaster affected people (roy et al. (2008). Although objectives may have

differences, as a functions humanitarian relief mechanism is similar to the commercial supply chain. In a humanitarian supply chain, the people affected by the disaster play the role of the customers. The demand is the customer's need. The government, NGOs, other donor organizations play the role of intermediate suppliers. There are some basic differences between commercial supply chain and humanitarian supply chain. In commercial supply chain the final goal is to increase profit of the company but in the humanitarian supply chain the final goal is to reduce loss of lives and help the beneficiaries. In commercial supply chains there is uncertain demand but within known parameters or data but in Humanitarian supply chain after need assessments the forecasted demand is known but sudden spikes of demand occur, which is unpredictable (Roy and Roy, 2004).

The effectiveness last mile relief distribution, the effectiveness of a response plan depends on following four decisions:

a. Facility location decision.
b. Inventory decision.
c. Transportation decision.
d. Distribution decision.

Facility location decision deals with identifying number of most suitable locations and distribution centres in the relief network which facilitates the efficient delivery of relief material, location of relief camps during flood situations and the available capacity of the facility required to cater for the requirement. Inventory decision mainly concern on what inventory to be stored, target inventory levels, stock replenishment policy, order quantity and safety stock levels and how efficiently manage the inflow and outflow of relief material.

The most significant logistical problem in the last mile relief operation is the limitations related to the transportation resources and emergency supplies, difficulties due to damaged transportation infrastructure and lack of coordination among relief workers. It is a challenging task for relief agencies to develop effective and efficient distribution plans in such a complex environment. Therefore, NGOs may make distribution decisions using ad – hoc methods, which may lead to inefficient and ineffective response. non that achieving the effective and efficient distribution plan with a coordinated mechanism (Balcik, Beamon and Smilowitz, 2008)

RESEARCH METHODOLOGY

Considering the severity of the flooding, the researcher narrowed down to seven divisional areas (Matara, Kotapola, Aturaliya, Akuressa, Pitabeddara, Thihagoda and Walipitiya) to select the sample. Purposive sampling technique was used to gather data through the questionnaire distributed among Grama Seva Officials.

Conceptualization

Based on the literature review, the following variables have been identified to proceed with the research:

a. **Independent Variables:**

(1) Infrastructure Facility
(2) Warehouse and Inventory Facility
(3) Distribution Facility
(4) Human resource Availability
(5) Information Flow
(6) Financial Assistance

b. **Dependent Variable:**

(1) Efficiency of Last Mile Humanitarian Logistics Opera tion

.

Operationalization of the Conceptual Framework

In order to operationalize the research, the questionnaire has been designed to measure the degree of the contribution of the above mentioned seven variables and thirty indicators to analyse factors which affect the efficiency of last mile logistics operations.

FINDINGS AND DISCUSSIONS

Discussion

The overall reliability of the survey instrument indicates that the constructs are measured accurately, and the descriptive statistics reveal moderate to high

levels of satisfaction in several areas. Factor analysis confirms that the survey items load strongly on their respective constructs, thereby supporting the validity of the measurement model. However, a few dimensions - such as the availability of helipads for emergency response, timeliness in receiving funds, and the integration of modern IT tools show relatively lower performance.

Infrastructure Facility

Respondents generally rated the availability of transport and communication facilities. Lower scores for helipad availability underscore a vulnerability in rapid aerial support, which may be critical in regions with flooded roads The lower scores for the availability of safe camps demands a considerable attention towards the improvements of the safe camps. Respondents generally accepted the quality of communication facilities which provides a positive indication as well as it could be positively impact on the satisfactory level of the information flow during the logistics operations. As per the findings, there is a significant relationship between infrastructure facility and the efficiency of the last mile humanitarian logistics operations.

Inventory and Warehouse Facility

Whilst the preparedness of pre-positioned stocks is relatively less satisfactory, delays in consignment arrivals were noted. This suggests that initial distribution of relief items may be delayed due to the time taken for fulfilling the necessary stock level for the commencement of the logistics operation. Hence, the distribution network may be hampered by logistical constraints. Availability of the regional warehouse facility also in the quiet low level and it needs to be a matter of priority as proper storage provides many advantages for an efficient distribution process. The accuracy of the accounting of relief items is comparatively in the positive level. However, maintaining a common mechanism to stocking and warehousing will enhance the overall productivity. Inventory and warehouse facility also positively relate to the efficiency of the last mile humanitarian logistics operations. Hence, policies and procedures to be formulated to develop these resources in accordance with the varying demands.

Distribution Facility

The overall moderate ratings on distribution coordination indicate that while monitoring and transport availability are acceptable, inter-agency coordination remains a challenge. Prioritization in allocation of relief items is in moderate-

ly lower level as prioritization needs to be arranged in a proper manner with considering the demand and the availability. Safety and security of the relief items is in the satisfactory level which provides a positive indication on the arrangements to ensure the safety of the items. Distribution facility also have a positive relation with the efficiency of the logistics operations.

Human Resource Availability

The relatively high scores in manpower availability and competence are encouraging. It indicates that, there is a positive sign in the contribution of trained and untrained human resource towards the relief operations. However, the gap in continuous training initiatives points to the need for regular capacity-building programs. There is slightly lower tendency in the availability of the volunteer personnel for the relief operations. Availability of the human resource has a positive correlation with the efficiency of the last mile humanitarian logistics operations.

Financial Support

Financial mechanisms appear to be the least robust, with issues related to fund mobilization and transparency. The relatively lower mean scores in this area may hinder rapid procurement and delivery of relief items. There is a significant low score for the convenience of obtaining additional funds during emergency situations which hinder the flexibility of the operations. Hence, it is required to see the possibility of formulating a proper methodology to influx funds for unforeseen situations and it should be monitored and accounted properly.

Information Flow

Information flow emerged as a critical success factor, with the highest correlation with overall efficiency. Timeliness and the clarity of the information received from the higher authorities takes significantly higher level which is a positive sign on the leadership of the logistics operations in the Matara District. However, frequency of updates during emergencies takes a considerably lower score which provides room for improvements in the monitoring mechanism of the operations. The most significant fact which could be derived from the findings is that the in cooperation of the modern IT and GPS technology for real time tracking becomes considerably low in the Matara District. This portray a clear picture on the level of integration of technology into disaster relief operations in Matara District.

Efficiency of Last Mile Operations

Despite overall moderate ratings, the regression analysis indicates that improvements in each independent variable contribute significantly to enhanced operational efficiency. The odds ratios in the Ordered Logistics Regression suggest that incremental improvements in infrastructure, inventory management, distribution coordination, human resources, financial support, and especially information flow can lead to a noticeable increase in the likelihood of successful relief operations.

Furthermore, the moderately strong correlations among the constructs suggest that a holistic approach is needed to improve last mile operations. Enhancements in infrastructure or inventory alone may not suffice unless they are complemented by improvements in human resource training, financial management, and integrated information systems.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This chapter explains the entire research outcomes. It consists of the conclusion of the research, verifications of each level of success in achieving the research proposal attributed by research problem, objectives, recommendations, and provide basement for future research. At the outset, it will provide an account on whether the research problem, objectives have been achieved and followed by the recommendations with relevance to the research finding. Finally, the chapter covers the suggestion to carry out further research based on the concept design and recommendations.

Recommendations Based on Findings

Based on the findings, the following recommendations are drawn:

a. **Infrastructure Facilities.** Evaluate the standards of the identified safe camps for the accommodation of affected community and make arrangements to improve basic facilities (Bedding, safe drinking facilities, ablutions, etc.). Identify suitable locations for helipads and make arrangements to ensure that helipads are safe for emergency operations.

Make early arrangements to provide necessary boat facilities for relief activities. Formulate a joint planning with the Sri Lanka Navy to operate boat service. Improve the existing roads running towards the identified relief camps to minimize the effects on transportation due to flooding. Identity safe routes for logistics supply and establish logistics centres which can be easily access through the safe roads.

b. **Warehouse and Storage Facilities.** Establish regional warehouses in Matara district in order to pre-position the essential relief items and need to identify a suitable area for the warehouse.

Identify the essential relief items and store them in optimum quantities in order to achieve the economy and eliminate the warehouse cost. Identify safe locations for the village level storage sites and improve their standards for proper storing of relief items.

Introducing a proper accounting system as well as introducing a system to manage the stock level by enhancing the visibility of the ware house management will provide timely and accurate information for decision makers.

c. **Distribution Facilities.** Introduce a standard record keeping mechanism with necessary accounting facilities to ensure that all received and issued items are properly recorded and these data can be used to analyse the logistics requirements for future requirements.

Establishment of an emergency operation cell to monitor and coordinate all the activities and representatives from Army, Navy, Air Force, Police, Disaster Management Centre should act with close coordination of activities. Develop a centralized coordination system and integrate NGO and donor activities.

d. **Human Resource Availability.** Formulate a proper mechanism to recruit volunteers for disaster relief operations and train them in regular basis. Implement regular training programs and simulation exercises for disaster scenarios. Especially, strengthen the village level disaster relief committees and train them in order to perform the last mile logistics operations in a professional manner.

Government should collaborate with relevant private institutes and NGOs to create a professional logistics community to enable humanitarian logisticians to share knowledge and experience on common issues and to create a consistent, powerful voice with all the stakeholders in the sector.

e. **Financial Support.** Streamline funding procedures and establish clear protocols for fund mobilization. Establishment of a suitable mechanism to monitor and accounting of financial aids receive from donor agencies and philanthropists.

Strengthening of the Grama Seva officials with essential financial backing to cater for the unforeseen demands during the humanitarian logistics operations.

f. **Information Flow.** Establish a network for information sharing by covering all the Grama Seva divisions and it should reach the ground level. This network should continuously update the information and decision makers will be able to take prompt action in the logistics operation.

Integrate advanced IT and GPS systems for real-time tracking and communication. Humanitarian relief organizations have a common need for integrated IT solutions that support procurement, distribution through a pipeline, tracking and tracing of goods and funds, flexible and robust reporting, and connectivity in the field.

It is required to formulate a mechanism on update the community of the real situation, health issues, preventive measures and safety measures via a telephone message service (Ex : SMS Alerts).

REFERENCES

Atlas,W. (2024).Yearly & Monthly weather – Matara, Sri Lanka.[nline] Weather Atlas. Available at: http://www.weather-atlas.com/en/sri-lanka/matara-climate(Accessed 20 Mar.2025)

Balcik,B.,Beamon,B.M.and Smilowitz,K.(2008).Last Mile Distribution in Human Relief.journal of intelligent Transportation Systems,12(2),pp.51 – 63.doi:http://doi.org/10.1080/15472450802023329

Crisis.med.uoa.gr. (2018). The logistics chain of emergency supplies during natural disasters[online]Available at: http://crisis.med.uoa.gr/elibrary/15.pdf[Accessed 1 Mar 2018]

Dohale,Vishwas,Ambikar,Priya,Gunasekaran,Angappa and Bilolikar,Vijay (2022). Examining the barriers to operationalization of humanitarian supply chains:lessons learned from COVID – 19 crisis. [research] Available at: file:///C:/Users/DELL/Downloads/s10479-022-04752-x.pdf [Accessed 27 Jan.2025]

Disastermin.gov.lk. (2017). National Council for Disaster Management. [online] Available at:http://www.disastermin.gov.lk/web/index.php?option=com_content&view=article&id=51&Itemid=64&lang=en [Accessed 11 Nov. 2017]

Farhani,R.,Rezapour,S. and Kardar,L,(2022).Logistics Operations and models – Concept and operations, First ed. [online] New York: Elsevier,p.464,Available at : Farhani,R. (2011). Logistics Operations and Management – Concept and Models, first ed. [online] Transported by L. Kardar. New York: Eksevier,p.464.

https://www.parliament.lk/papers_presented/04062013/performance_report_district_secretariat_matara_2012.pdf [Accessed 19 Feb. 2018]

Iom.int. (2017). Cite a Website - Cite This For Me. [online] Available at: https://www.iom.int/sites/default/files/situation_reports/file/Sri-Lanka-Floods-IOM-Situation-Report-2-5June2017.pdf [Accessed 19 Feb. 2018].

Lessons Learnt Report 2016. (2016)-[online] Logistics Cluster. Available at : http://cdn.logcluster.org/public/logisticsc

Reliefweb.int. (2014). Sri Lanka disaster management reference hand book. [online] Available at: https://reliefweb.int/sites/reliefweb.int/file