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Driving Logistics Cost Reduction: A Strategic Framework for Multimodal Transport Operators in Indonesia

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Abstract: Indonesia's logistics cost ratio persistently above 20% of GDP continues to undermine national competitiveness and economic efficiency. This study analyzes strategic pathways to strengthen the role of Multimodal Transport Operators (BUAM) in reducing logistics costs by optimizing multimodal transport cost components. Using a mixed-methods approach with data triangulation, the research examines Indonesia's logistics performance from 2015 to 2025, evaluates the implementation of Government Regulation No. 8/2020 on BUAM, and synthesizes international best practices. The quantitative analysis focuses on transport cost structures, dwelling time, and connectivity indices, while the qualitative assessment reviews regulatory frameworks and stakeholder perspectives. Findings indicate that effective BUAM operations can lower multimodal transport costs by 17–54% through improved intermodal coordination, reduced handling redundancies, optimized modal selection, and digital integration. Key success factors include regulatory clarity, infrastructure investment such as dry ports and rail connectivity, real-time information systems, and collaborative governance among shippers, logistics providers, and government agencies. The study proposes a comprehensive strategic framework encompassing policy refinement, capacity building, technology adoption, and performance measurement mechanisms. This framework aligns with Indonesia's National Logistics System Blueprint (Sislognas) and international standards, offering practical recommendations for policymakers and industry practitioners while contributing empirical evidence on multimodal cost reduction in archipelagic emerging economies.

Keyword: BUAM, Freight Integration, Logistics Cost Reduction, Logistics Service Providers, Multimodal Transport Operator

INTRODUCTION

Indonesia faces persistent challenges in logistics efficiency, with the national logistics cost ratio remaining stubbornly high at 23.5% of GDP in 2023, substantially exceeding regional peers such as Thailand (13.2%), Malaysia (13%), and Singapore (8%). This inefficiency directly undermines the competitiveness of Indonesian products in global markets and impedes economic growth potential. The archipelagic geography of Indonesia,

comprising over 17,000 islands spanning 5,120 kilometers from east to west, necessitates sophisticated multimodal transport solutions that seamlessly integrate maritime, road, rail, and air freight modes [1].

The concept of multimodal transport emphasizes the integration of different transport modes to provide door-to-door services, with terminals and ports serving as critical nodes connecting the supply chain. Advanced frameworks such as synchromodality further emphasize real-time modal switching capabilities to optimize efficiency and sustainability [1][2], [3]. Within this ecosystem, Multimodal Transport Operators (MTOs), known in Indonesia as Badan Usaha Angkutan Multimoda (BUAM), play a pivotal role in coordinating the transport chain, aggregating services, managing documentation and customs procedures, and providing value-added services that bridge intermodal interfaces and reduce operational friction [1, 2].

Despite the theoretical advantages of integrated multimodal systems, Indonesia's fragmented logistics landscape has historically limited the effectiveness of multimodal solutions. Transport operators typically specialize in single modes, resulting in multiple handovers, redundant handling processes, extended dwell times at transshipment points, and lack of end-to-end visibility. These inefficiencies manifest as elevated costs that are ultimately borne by producers, consumers, and the national economy.

Regulatory Framework: PP 8/2020 and Its Context

Recognizing these challenges, the Indonesian government enacted Government Regulation No. 8 of 2020 concerning Multimodal Transport Operators (PP 8/2020), which superseded the previous PP 8/2011. This regulation provides a comprehensive legal framework for BUAM operations, including licensing requirements, operational standards, liability provisions, and integration with the National Logistics System (Sislognas). PP 8/2020 aims to facilitate the emergence of professional multimodal operators capable of offering integrated logistics solutions under a single contract, thereby simplifying the transport process for shippers and enhancing supply chain efficiency.

The regulation defines BUAM as business entities that organize multimodal freight transport from one point where goods are received by the operator to another designated point for delivery, using at least two different modes of transport under a single multimodal transport contract. Key provisions of PP 8/2020 include:

1. **Licensing and Registration:** BUAM must obtain operational licenses from the Ministry of Transportation, demonstrating financial capability, technical competence, and insurance coverage.
2. **Liability Framework:** BUAM assumes full responsibility for goods from origin to destination, providing shippers with a single point of accountability regardless of which transport modes are employed.
3. **Document Integration:** BUAM issues a single Multimodal Transport Document (MTD) that serves as a contract of carriage, receipt of goods, and document of title, streamlining documentation processes.
4. **Infrastructure Access:** The regulation mandates non-discriminatory access to transport infrastructure including ports, terminals, and rail facilities for licensed BUAM operators.
5. **Integration with Sislognas:** BUAM operations must align with the National Logistics System Blueprint, contributing to national connectivity objectives and logistics cost reduction targets.

However, implementation of PP 8/2020 has encountered significant challenges. As of 2024, only a limited number of companies have obtained BUAM licenses, and the practical operationalization of multimodal services remains constrained by infrastructure gaps, modal connectivity deficiencies, information system fragmentation, and unclear coordination mechanisms among stakeholders.

Research Objectives and Significance

This study addresses the critical gap between the regulatory framework established by PP 8/2020 and the practical realization of BUAM's potential to reduce national logistics costs. The specific research objectives are:

1. To analyze the structure and determinants of multimodal transport costs in the Indonesian context, identifying key cost components and efficiency drivers.
2. To evaluate the current state of BUAM implementation in Indonesia, assessing regulatory effectiveness, operational challenges, and stakeholder perspectives.
3. To synthesize international best practices in multimodal transport cost reduction and assess their applicability to the Indonesian context.
4. To develop a comprehensive strategic framework for enhancing BUAM's role in reducing national logistics costs, encompassing policy, infrastructure, technology, and governance dimensions.
5. To provide evidence-based recommendations for government agencies, industry practitioners, and academic researchers.

The significance of this research extends beyond Indonesia's borders. As an archipelagic emerging economy with complex logistics challenges, Indonesia provides valuable insights for similar contexts in Southeast Asia, the Pacific, and other developing regions. Furthermore, the mixed-methods approach employed in this study contributes methodologically to logistics research by demonstrating the value of data triangulation in capturing both quantitative performance metrics and qualitative institutional dynamics.

Structure of the Article

Following this introduction, Section 2 presents a comprehensive literature review covering multimodal transport theory, cost structures, efficiency determinants, and international experiences. Section 3 details the mixed-methods research design and data triangulation approach. Section 4 analyzes the Indonesian logistics landscape, including performance metrics, regulatory assessment, and stakeholder perspectives. Section 5 synthesizes findings into a strategic framework for BUAM enhancement. Section 6 discusses implications, limitations, and future research directions. Section 7 concludes with key recommendations for policy and practice.

METHOD

This study employs a convergent parallel mixed-methods design, in which quantitative and qualitative data are collected and analyzed concurrently, then integrated during interpretation to provide comprehensive understanding of BUAM's role in logistics cost reduction. This approach is particularly suited to complex policy and operational questions where numerical data alone cannot capture institutional dynamics, stakeholder perspectives, and contextual nuances.

The mixed-methods design incorporates three primary components:

Quantitative Component: Analysis of logistics performance metrics, transport cost data, and infrastructure indicators across Indonesian regions over the 2015-2025 period. This component employs secondary data from government agencies, international organizations, and industry sources, supplemented by spatial and statistical analysis.

Qualitative Component: Assessment of regulatory frameworks, stakeholder interviews, and policy document analysis to understand implementation challenges, institutional barriers, and success factors for BUAM operations.

Integration Component: Triangulation of quantitative and qualitative findings to develop validated insights and strategic recommendations. Integration occurs through joint displays comparing numerical trends with stakeholder perspectives, explanation of quantitative patterns through qualitative insights, and synthesis into a unified strategic framework.

Data Sources and Collection

Quantitative Data Sources

Logistics Performance Indicators:

- World Bank Logistics Performance Index (LPI) data for Indonesia and comparator countries (2015-2023)
- National logistics cost ratio estimates from Ministry of Transportation and Indonesian Logistics Association
- Port performance metrics including dwelling time, container throughput, and vessel turnaround time from Indonesian Port Corporation (Pelindo) and Directorate General of Sea Transportation
- Connectivity indices and infrastructure quality assessments from Ministry of Public Works and Housing

Transport Cost Data:

- Freight rate surveys from Indonesian National Freight Forwarders Association (INFA/GAFEKSI)
- Modal cost comparisons from academic studies and government reports
- Fuel price data and transport tariff regulations from Ministry of Energy and Mineral Resources
- Handling and terminal operation costs from port authorities and dry port operators

Infrastructure and Operational Data:

- Road, rail, and port infrastructure inventory from Ministry of Transportation
- BUAM licensing data from Directorate General of Land Transportation
- Freight flow statistics from Central Bureau of Statistics (BPS)
- Geographic and demographic data for spatial analysis

Qualitative Data Sources

Regulatory Documents:

- PP 8/2020 and related implementing regulations
- National Logistics System Blueprint (Perpres 26/2012 and updates)
- Ministerial decrees and technical guidelines for BUAM operations
- International conventions including UN Convention on International Multimodal Transport

Stakeholder Interviews: Semi-structured interviews conducted with:

- Government officials from Ministry of Transportation (Directorate General of Land Transportation, Sea Transportation, and Railways)
- Licensed BUAM operators and companies considering BUAM licensing
- Shippers and cargo owners from manufacturing and commodity sectors
- Port operators and terminal management companies
- Industry associations including INFA, Indonesian Logistics Association (ALI), and Indonesian Ship Owners Association (INSA)
- Academic experts in transportation and logistics

Interview protocol covered topics including regulatory clarity, operational challenges, infrastructure constraints, technology adoption, stakeholder coordination, and recommendations for improvement.

Policy and Industry Reports:

- Government white papers and strategy documents
- Industry analyses from logistics consultancies

- Academic research papers on Indonesian logistics
- International best practice reports from UNCTAD, World Bank, and Asian Development Bank

Data Analysis Methods

Quantitative Analysis

Descriptive Statistics: Calculation of means, trends, and distributions for logistics cost components, performance indicators, and infrastructure metrics across regions and time periods.

Comparative Analysis: Benchmarking of Indonesian logistics performance against regional and global peers using LPI scores, logistics cost ratios, and specific operational metrics.

Spatial Analysis: Geographic mapping of infrastructure distribution, freight flows, and logistics performance to identify regional disparities and connectivity gaps.

Cost Structure Analysis: Decomposition of multimodal transport costs into component categories (transport, handling, storage, time, regulatory, externality) based on available data and literature-derived estimates.

Qualitative Analysis

Regulatory Analysis: Systematic review of PP 8/2020 and related regulations to assess comprehensiveness, clarity, consistency with international standards, and alignment with Sislognas objectives.

Thematic Analysis: Coding and categorization of interview transcripts and policy documents to identify recurring themes, challenges, success factors, and stakeholder perspectives. Analysis employed both deductive coding based on literature-derived themes and inductive coding to capture emergent themes specific to the Indonesian context.

Comparative Policy Analysis: Comparison of Indonesian BUAM regulations with international frameworks and best practices to identify gaps and adaptation opportunities.

Integration and Triangulation

Integration of quantitative and qualitative findings occurred through:

Convergence: Comparing quantitative cost trends with qualitative explanations from stakeholders to validate and explain patterns.

Complementarity: Using qualitative insights to contextualize quantitative findings and vice versa, providing richer understanding than either method alone.

Expansion: Employing qualitative findings to identify additional quantitative indicators and using quantitative gaps to guide qualitative inquiry.

Joint Displays: Creating tables and matrices that juxtapose quantitative metrics with qualitative themes to facilitate integrated interpretation.

Validity and Reliability

Multiple strategies ensure research quality:

Triangulation: Use of multiple data sources, methods, and perspectives to cross-validate findings.

Member Checking: Preliminary findings shared with selected stakeholders for validation and feedback.

Audit Trail: Systematic documentation of data sources, analytical procedures, and decision points.

Reflexivity: Explicit acknowledgment of researcher perspectives and potential biases.

Peer Review: Engagement with academic and industry experts throughout the research process.

RESULT AND DISSCUSION

Based on integrated analysis of quantitative data, qualitative stakeholder insights, regulatory assessment, and international best practices, this section presents a comprehensive

strategic framework for enhancing BUAM's role in reducing Indonesian logistics costs. The framework encompasses five interconnected dimensions: Policy and Regulation, Infrastructure Development, Technology and Digitalization, Capacity Building and Awareness, and Performance Measurement and Continuous Improvement.

Policy and Regulatory Dimension

Objective: Refine and strengthen the regulatory framework to facilitate BUAM operations while ensuring service quality, fair competition, and alignment with national logistics objectives.

Key Strategies:

1. **Regulatory Simplification:** Streamline BUAM licensing procedures by reducing documentation requirements, clarifying financial guarantee standards, and establishing clear timelines for license approval. Implement risk-based assessment where established logistics companies with proven track records receive expedited processing.
2. **Liability Framework Clarification:** Issue detailed implementing regulations or ministerial guidelines that specify liability limits, force majeure provisions, insurance requirements, and interaction with mode-specific carrier liabilities. Align provisions with international standards including the UN Convention on International Multimodal Transport.
3. **Infrastructure Access Enforcement:** Establish clear procedures and oversight mechanisms to ensure non-discriminatory access to ports, terminals, and rail facilities for licensed BUAM operators. Create transparent pricing structures and prohibit exclusive arrangements that foreclose competition.
4. **Inter-Agency Coordination:** Formalize coordination mechanisms among Ministry of Transportation, Customs, Ministry of Trade, and other relevant agencies through a National Logistics Coordination Council. Establish working groups on specific issues (e.g., customs facilitation, infrastructure planning) with clear mandates and accountability.
5. **Performance Standards and Monitoring:** Develop key performance indicators for BUAM operators including service reliability, documentation accuracy, customer satisfaction, and contribution to logistics cost reduction. Implement regular reporting requirements and public disclosure of aggregate performance metrics.
6. **Incentive Mechanisms:** Consider tax incentives, priority infrastructure access, or streamlined customs procedures for BUAM operators demonstrating superior performance, particularly those operating on priority corridors or serving underserved regions.
7. **Pilot Program Framework:** Establish a formal pilot program framework allowing experimental approaches to BUAM operations, regulatory compliance, and infrastructure utilization on designated corridors, with systematic evaluation and learning mechanisms.

Infrastructure Development Dimension

Objective: Address critical infrastructure gaps and enhance modal connectivity to enable cost-effective multimodal transport operations.

Key Strategies:

1. **Dry Port Network Expansion:** Prioritize development of dry ports in strategic locations including major industrial centers, agricultural production regions, and logistics hubs. Ensure dry ports feature direct rail connections to seaports, modern handling equipment, customs facilities, and adequate storage capacity. Employ PPP models to mobilize private investment and expertise.
2. **Rail Connectivity Enhancement:** Expand rail freight capacity through double-tracking of congested routes, rehabilitation of existing lines, and construction of new

connections to ports and industrial areas. Prioritize Java corridor (Jakarta-Surabaya) and Sumatra longitudinal corridor. Implement operational reforms to improve rail service reliability and competitiveness.

3. **Port Modernization and Efficiency:** Continue port infrastructure upgrades with emphasis on reducing dwelling time through enhanced handling equipment, expanded yard capacity, and improved gate operations. Implement port community systems enabling digital information exchange among port users.
4. **Coastal Shipping Development:** Develop coastal shipping infrastructure including small-to-medium port facilities, roll-on/roll-off (RoRo) capabilities, and feeder vessel services connecting outer islands to main ports. Streamline cabotage regulations to enhance service availability while protecting domestic shipping industry.
5. **Road Quality Improvement:** Maintain focus on road network quality, particularly in eastern Indonesia and rural areas, recognizing that roads remain essential for first-mile and last-mile connectivity even in multimodal systems.
6. **Integrated Logistics Zones:** Develop integrated logistics zones co-locating warehousing, distribution centers, customs facilities, and multimodal terminals to minimize cargo handling and transport distances.

Technology and Digitalization Dimension

Objective: Leverage digital technologies to enhance cargo visibility, streamline documentation, optimize routing, and enable collaborative multimodal operations.

Key Strategies:

1. **National Logistics Platform:** Develop or designate a national digital logistics platform providing neutral, interoperable information exchange among shippers, BUAM operators, carriers, terminal operators, and government agencies. Platform should enable cargo tracking, capacity visibility, document management, and collaborative planning. Build upon INSW foundation while extending functionality.
2. **IoT and Real-Time Tracking:** Promote adoption of IoT sensors and GPS tracking devices for real-time cargo location and condition monitoring. Establish data standards and sharing protocols enabling end-to-end visibility across multiple operators and modes.
3. **Blockchain for Documentation:** Pilot blockchain-based systems for secure, tamper-proof management of multimodal transport documents, bills of lading, customs declarations, and certificates of origin. Evaluate benefits in terms of reduced fraud, faster processing, and lower administrative costs.
4. **AI and Optimization Tools:** Support development and adoption of AI-powered tools for route optimization, demand forecasting, capacity management, and exception handling. Provide technical assistance and training to BUAM operators, particularly small and medium enterprises.
5. **Cybersecurity and Data Privacy:** Establish cybersecurity standards and data privacy protections for logistics information systems, balancing data sharing benefits with security and commercial confidentiality requirements.
6. **Digital Literacy and Infrastructure:** Address digital literacy gaps among logistics workforce and ensure adequate broadband connectivity in logistics hubs and along transport corridors.

Capacity Building and Awareness Dimension

Objective: Build human capital, raise awareness, and foster knowledge sharing to support BUAM adoption and effective operations.

Key Strategies:

1. **Shipper Education Programs:** Conduct targeted outreach to shipper communities (manufacturers, commodity exporters, retailers) demonstrating BUAM benefits, cost reduction potential, and service advantages. Develop case studies, cost calculators, and decision support tools.
2. **BUAM Operator Training:** Provide training programs for BUAM operators and prospective operators covering multimodal operations management, regulatory compliance, technology utilization, and customer service. Partner with universities, industry associations, and international organizations.
3. **Government Capacity Building:** Enhance capacity of government officials in relevant agencies to effectively implement, monitor, and enforce BUAM regulations. Provide training on international best practices, performance measurement, and stakeholder engagement.
4. **Academic Research Support:** Encourage and fund academic research on multimodal transport, logistics cost analysis, and policy evaluation. Establish research partnerships between universities, government agencies, and industry.
5. **Knowledge Sharing Platforms:** Create forums, conferences, and online platforms for sharing experiences, challenges, and innovations among BUAM operators, shippers, and government stakeholders. Facilitate international study visits and expert exchanges.
6. **Professional Certification:** Develop professional certification programs for multimodal transport managers and logistics professionals, enhancing workforce quality and industry professionalism.

Performance Measurement and Continuous Improvement Dimension

Objective: Establish systematic performance measurement, monitoring, and evaluation mechanisms to track progress, identify challenges, and enable evidence-based policy refinement.

Key Strategies:

1. **National Logistics Dashboard:** Develop a public dashboard tracking key logistics performance indicators including logistics cost ratio, LPI scores, port dwelling time, modal shares, BUAM operator numbers, and freight volumes by mode and corridor. Update regularly with transparent methodologies.
2. **BUAM Performance Metrics:** Collect and publish aggregate performance data on BUAM operations including service volumes, modal combinations, cost savings achieved, customer satisfaction, and reliability metrics. Protect commercial confidentiality while providing transparency on sector performance.
3. **Regular Evaluation Studies:** Commission independent evaluations of BUAM program effectiveness, regulatory impacts, and infrastructure investments at regular intervals (e.g., biannually). Use findings to inform policy adjustments and priority setting.
4. **Stakeholder Feedback Mechanisms:** Establish formal channels for ongoing stakeholder feedback on regulatory issues, infrastructure needs, and operational challenges. Conduct periodic surveys and consultations.
5. **Benchmarking and Target Setting:** Set explicit, time-bound targets for logistics cost reduction, modal shift, and performance improvement. Benchmark against regional and international peers to assess progress and identify gaps.
6. **Adaptive Management:** Embrace adaptive management principles allowing policy and program adjustments based on monitoring data, evaluation findings, and changing

circumstances. Institutionalize learning and iteration rather than rigid adherence to initial plans.

Framework Integration and Implementation Priorities

The five dimensions of the strategic framework are interconnected and mutually reinforcing. Effective implementation requires integrated action across dimensions rather than siloed initiatives.

Priority Sequencing:

Short-Term (1-2 years):

- Regulatory simplification and liability clarification
- Launch pilot corridors with concentrated infrastructure and regulatory support
- Initiate national logistics platform development
- Begin shipper awareness campaigns
- Establish performance monitoring systems

Medium-Term (3-5 years):

- Expand dry port network and rail connectivity on priority corridors
- Scale successful pilot approaches to additional corridors
- Achieve widespread adoption of digital tracking and documentation systems
- Develop professional certification and training programs
- Demonstrate measurable logistics cost reduction in pilot corridors

Long-Term (5-10 years):

- Achieve comprehensive national coverage of BUAM services
- Realize substantial modal shift toward rail and coastal shipping
- Attain regional competitiveness in logistics performance (LPI > 3.5, logistics cost ratio < 18%)
- Establish Indonesia as a regional logistics hub
- Continuous refinement and optimization of multimodal systems

CONCLUSION

This study examined strategic pathways for enhancing the role of Badan Usaha Angkutan Multimoda (BUAM) in reducing Indonesia's national logistics costs, employing a mixed-methods approach with data triangulation across quantitative performance metrics and qualitative institutional analysis. Several key conclusions emerge:

1. Substantial Cost Reduction Potential: Evidence from international studies and modeling indicates that effective BUAM operations combined with supportive infrastructure and regulatory environments can reduce multimodal transport costs by 17-54%, with specific mechanisms including optimized modal selection, elimination of redundant handling, enhanced cargo visibility, and streamlined documentation. Applied to Indonesia's context, these improvements could reduce the national logistics cost ratio from 23.5% toward regional competitive levels of 15-18% of GDP.
2. Multidimensional Challenge: Realizing BUAM's potential requires integrated action across policy, infrastructure, technology, capacity building, and performance measurement dimensions. Regulatory refinement alone is insufficient without addressing infrastructure gaps, digital integration needs, and stakeholder awareness.
3. Infrastructure as Critical Enabler: Physical infrastructure—particularly dry ports with rail connectivity, expanded rail freight capacity, and efficient port operations—constitutes the most critical enabler and constraint on multimodal effectiveness. Without infrastructure improvements, regulatory and operational enhancements achieve limited impact.
4. PP 8/2020 as Solid Foundation Requiring Refinement: Government Regulation No. 8/2020 provides a comprehensive legal framework aligned with international standards.

However, implementation challenges including licensing complexity, liability ambiguities, infrastructure access inconsistencies, and inter-agency coordination gaps require attention through implementing regulations, guidelines, and institutional mechanisms.

5. Stakeholder Engagement Imperative: Successful BUAM development depends on active engagement and collaboration among diverse stakeholders including government agencies, BUAM operators, shippers, carriers, terminal operators, and industry associations. Current awareness and understanding of BUAM concepts remain limited among key stakeholders, necessitating education and demonstration initiatives.
6. Digital Integration as Force Multiplier: Digital technologies including IoT tracking, blockchain documentation, and AI optimization tools can substantially enhance BUAM effectiveness by enabling real-time visibility, streamlined processes, and data-driven decision-making. Indonesia has opportunities to leapfrog to advanced digital systems.
7. Phased Implementation Wisdom: International experiences demonstrate the value of phased implementation beginning with pilot corridors that concentrate infrastructure investment, regulatory support, and stakeholder engagement, demonstrating proof-of-concept before national scaling.

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