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STATE MANAGEMENT OF MARITIME SAFETY ASSURANCE IN VIETNAM

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INTRODUCTION

1. Rationale for Selecting the Topic

With a strategic geographic position, a coastline of more than 3,260 km, and a system of key seaports, Viet Nam relies primarily on maritime transport for import–export activities, accounting for over 90% of the total volume of international trade cargo. However, state management of maritime safety assurance in Viet Nam still shows limitations in institutional mechanisms, capital mobilization, technical–technological infrastructure, and supervision based on actual data. In the context of deep international integration, the requirements of sustainable marine economic development, and the current realities of the maritime sector, comprehensive and scientific research to refine solutions for "*State management of maritime safety assurance in Viet Nam*" is urgently necessary. This contributes to enhancing national competitiveness, ensuring security and safety, and promoting modernization of the maritime sector.

2. Research Objectives and Tasks

The dissertation aims to analyze theoretical foundations, develop and test a 2×3 model (two substantive domains: the maritime safety assurance system and maritime safety assurance services; and three state management functions: promulgation/issuance – organization of implementation – inspection and supervision), assess the current situation, and propose solutions to improve state management of maritime safety assurance in Viet Nam toward 2030, with a vision to 2045. Specific tasks include: conducting a scholarly literature review; systematizing the theoretical foundations; analyzing international experience; surveying, analyzing, and assessing the current situation of state management of maritime safety assurance in the period 2015–2025; and proposing a coherent system of solutions to improve state management of maritime safety in Viet Nam.

3. Object and Scope of the Study

The object of study is state management activities for maritime safety assurance in Viet Nam, implemented by the Ministry of Construction (previously

the Ministry of Transport until March 2025). The dissertation focuses on two domains: (i) organization and management of the maritime safety assurance system (planning, investment, infrastructure, maritime signaling, VTS, AIS); and (ii) management of the provision of maritime safety assurance services (maritime signaling, pilotage, maritime information), across the functions of issuance, implementation, and supervision. The scope covers Viet Nam's territory, with emphasis on seaport areas and locations where maritime safety assurance activities are conducted, and includes international comparisons (Singapore, Japan, Republic of Korea, the Netherlands/EU, and selected African countries). The analysis period is 2015–2025; proposed solutions extend to 2030, with a vision to 2045.

4. Research Methods

The dissertation employs a mixed-methods research design, integrating qualitative methods (document analysis, in-depth interviews with 25 experts, international comparison) and quantitative methods (survey of 250 samples, data processing using Python, EFA, CFA, SEM). Descriptive statistics are applied, and research ethics are strictly observed. Survey data were collected in 2025.

5. New Contributions of the Dissertation

Theoretical contribution: The dissertation develops and validates a model of state management for maritime safety assurance, structured by two domains (system organization and service management) and three state management functions (issuance, implementation, supervision).

Practical contribution: It assesses the current situation of state management (2015–2025), compares it with international models, and proposes comprehensive solutions toward 2030, with a vision to 2045.

Methodological contribution: The study applies a mixed qualitative–quantitative design, processes data using Python, and validates the model using SEM, highlighting the role of digital technologies and the legal system in state management.

6. Dissertation Structure

The dissertation consists of an Introduction, Conclusion, References, Appendices, and four chapters: (1) Overview of studies related to the topic of state management of maritime safety assurance; (2) Theoretical and practical foundations of state management of maritime safety assurance; (3) Current situation of state management of maritime safety assurance in Viet Nam; and (4) Solutions to improve state management of maritime safety assurance in Viet Nam.

CHAPTER 1. OVERVIEW OF STUDIES RELATED TO THE TOPIC OF STATE MANAGEMENT OF MARITIME SAFETY ASSURANCE

1.1. STUDIES ON THE ORGANIZATION AND MANAGEMENT OF THE MARITIME SAFETY ASSURANCE SYSTEM

1.1.1. Studies on Institutions, Policies, and the Legal Framework of the Maritime Safety Assurance System

Domestic and international studies on institutions, policies, and the legal framework governing the maritime safety assurance system focus on the role of international conventions (UNCLOS 1982, SOLAS 1974, SUA 1988) in defining the responsibilities of coastal States, port States, and flag States. Lương Thị Kim Dung (2019) emphasizes international compatibility and multi-actor legal responsibility in state management of maritime safety and security. Phan Văn Tuấn et al. (2024) analyze organizational management models in Asia–Pacific countries, clarifying central coordination mechanisms, decentralized implementation, and data interoperability. International studies (Troisi & Arena, 2022; Tietje & Reinhold, 2024) discuss foreign investment control, multi-sectoral coordination, protection of critical infrastructure, as well as challenges from digital transformation and new technologies (autonomous ships, cybersecurity).

1.1.2. Studies on Operational Organization and Technical Infrastructure of the System

This section synthesizes studies on the operation and development of technical infrastructure for maritime safety assurance, emphasizing coordination between “soft infrastructure” (processes, manuals) and “hard infrastructure” (navigational channels and traffic routing systems). Authors such as Lưu Việt Hùng (2019), Nguyễn Xuân Thịnh (2019), and Lê Tuấn Sơn et al. (2025) clarify the role of the human factor, safety margins, protection of critical infrastructure, and cybersecurity, thereby identifying challenges in risk governance and data protection in system operation.

1.1.3. Studies on Supervision, Auditing, and Evaluation of System Effectiveness

Domestic studies (Nguyễn Mạnh Cường & Phan Văn Hưng, 2021; Lương Tú Nam & Mai Xuân Hương, 2021; Lê Văn Thức, 2022) focus on developing risk indices and collision probability models, applying algorithms such as DBSCAN, AI, and neural networks for risk monitoring and warning. Internationally, Rachman et al. (2025) evaluate the effectiveness of AIS within VTS, emphasizing the role of equipment and human capacity in improving system supervision

1.2. STUDIES ON MANAGEMENT OF THE PROVISION OF MARITIME SAFETY ASSURANCE SERVICES

1.2.1. Studies on Service Standards and Policies

Research in this area addresses standards and policies for service quality, focusing on pilotage, constituent factors of service quality, and the role of international standards such as STCW, ISM, and ISPS. The studies also highlight the impact of human error and advocate for the application of UNCTAD port performance indicators to enhance service control and improvement

1.2.2. Studies on Professional Procedures and Service Provision

This section synthesizes research on standards and policies for service quality of maritime safety assurance, focusing on pilotage practice, constituent factors of service quality, and the role of international standards such as STCW, ISM, and ISPS. The studies also emphasize the impact of human error and propose applying UNCTAD port performance indicators for multidimensional assessment to enhance control and improve services.

1.2.3. Studies on Measurement and Quality Control of Services

Studies in this area focus on developing tools and indicators for measuring and controlling service quality. Issa-Zadeh & Garay-Rondero (2025) propose a KPI system based on environment, economy, and safety. Domestic studies develop risk indices and hotspot maps for data-driven management, with increasing application of big data and AI for forecasting and risk management.

1.3. ASSESSMENT OF THE LITERATURE REVIEW RESULTS

1.3.1. Issues Clarified by Existing Studies

Methodologically, research has evolved from qualitative description to the integration of big data and risk modeling. Early studies focused on legal frameworks and technical analysis, while recent work emphasizes the application of AIS and VTS for risk quantification and AI model development. There is a growing trend toward combining theory and practice. Theoretically, both international and domestic studies converge on the importance of safety, security, economic efficiency, and environmental sustainability in maritime safety assurance management. Evidence-based, measurement-driven models are increasingly adopted, with the State establishing assessment tools and services controlled by quality indicators. Human factors, digital technologies, cybersecurity, and multi-sectoral coordination are identified as critical elements for developing a maritime safety assurance management framework in Viet Nam. Emerging trends include risk governance based on big data, KPI system development, and the protection of critical infrastructure against cybersecurity and non-traditional threats. Research

also focuses on training legal and digital technology skills for maritime management, and the application of autonomous technologies, AI, and machine learning in risk warning and decision support. The integration of quantitative and qualitative research is seen as key to improving practical effectiveness.

1.3.2. Research Gaps

Gap in an integrated analytical framework: Existing studies often divide by functions or pillars and lack an integrated model connecting two domains (the maritime safety assurance system and maritime safety assurance services) across three fundamental functions (issuance, organization of implementation, inspection and supervision). The dissertation proposes the 2×3 framework to model management, supporting identification and resolution of issues aligned with Viet Nam's context and international practice. Gap in tools for measuring the results of state management: Existing works mainly focus on indices for assessing service quality, infrastructure operational effectiveness, or risk prediction, but lack a comprehensive set of criteria to measure the performance of the State management agency itself (quality of policy issuance, effectiveness of infrastructure implementation, rate of risk detection in supervision). The dissertation aims to develop a specialized KPI set for state management of maritime safety assurance under the 2×3 framework, meeting requirements of modern management, transparency, and accountability. Gap in Viet Nam's practical context: Many modern governance models are built from international experience but have not been sufficiently tested, adjusted, or fully applied to Viet Nam-specific factors such as institutions, infrastructure, human resources, and management culture. Moreover, during 2024–2025, a wave of organizational restructuring took place across state management agencies and the maritime sector nationwide, along with changes in policies and laws that created gaps requiring practical solutions. This dissertation focuses on validating and adjusting models, standards, and procedures to fit Viet Nam's realities, thereby contributing to a more distinctive and effective governance framework. Gap in research methods: Previous studies mainly used qualitative methods or small-scale quantification. This dissertation applies mixed methods with

a survey of 250 respondents, in-depth interviews with 25 experts, data processing using Python, and integrated quantitative and qualitative analysis to enhance reliability, objectivity, and practical applicability in state management of maritime safety assurance.

1.3.3. Research Orientation of the Dissertation

The dissertation focuses on systematizing theories of state management of maritime safety assurance, developing the 2×3 analytical framework, building specialized KPI indicators, and adjusting the model to fit Viet Nam's realities. Using mixed methods and Python for large dataset processing, alongside SEM testing, the dissertation assesses the current situation (2015–2025) to identify limitations and causes, and proposes solutions for improvement toward 2030, with a vision to 2045.

CHAPTER 2. THEORETICAL AND PRACTICAL FOUNDATIONS OF STATE MANAGEMENT OF MARITIME SAFETY ASSURANCE

2.1. OVERVIEW OF MARITIME SAFETY AND MARITIME SAFETY ASSURANCE

2.1.1. Concept of Maritime Safety

Maritime safety is defined as a condition in which all risks arising from maritime activities are controlled at an acceptable level through a system of international technical rules and standards established by the International Maritime Organization (IMO). Key characteristics include its global nature, multidimensionality (legal, technical, organizational, social), dynamism (risk governance, technological adaptation), multi-actor participation (State, enterprises, international community), and increasing digitalization with a focus on cybersecurity.

2.1.2. Concept of Maritime Safety Assurance

Maritime safety assurance (MSA) is an institutional–organizational–technical operational mechanism to maintain safety objectives in practice. It is a system of public services and data operating continuously to minimize risks and ensure stable,

smooth, and sustainable transport flows. MSA is the responsibility of the coastal State to organize, provide, and maintain essential public services (AtoN, MSI, VTS, pilotage, SAR) on the basis of domestic incorporation and uniform implementation. Its characteristics include essential public services, inter-sectoral and multi-actor nature, reliance on digital data platforms and new technologies, prevention and recovery, and contribution to maintaining continuity of the transport chain even after incidents.

2.1.3. Role of Maritime Safety Assurance

Maritime safety assurance plays a pivotal role in the sustainable development of the global maritime transport sector and the marine economy. It protects people, assets, cargo, and the environment; safeguards international trade; enhances national reputation and competitiveness; and enforces sovereignty while preventing illegal activities at sea.

2.2. STATE MANAGEMENT OF MARITIME SAFETY ASSURANCE

2.2.1. General Overview of State Management of Maritime Safety Assurance

2.2.1.1. Concept, Management Actors, and Scope

State management of maritime safety assurance is the aggregate of activities performed by the national maritime management authority to issue mechanisms, organize implementation, inspect, supervise, and address issues related to safety in the maritime domain, based on national law and international conventions and standards. It is a modern public governance model based on outcomes, data, and accountability, aiming at safety, sustainability, and international integration. Management actors include policy-making bodies, specialized agencies, units operating maritime signaling systems, vessel traffic management centers, pilotage services, and search and rescue forces. The scope of management includes both the legal space (waters under national jurisdiction and relevant international sea areas) and the technical space (operational coverage of positioning, communication, and vessel monitoring systems), with regional and international coordination.

2.2.1.2. Objectives, Characteristics, and Trends

Objectives of state management include ensuring a high level of safety for maritime activities, protecting human life, assets, and the marine environment, maintaining smooth maritime traffic, supporting trade growth, and promoting sustainable development of the marine economy. Key characteristics are inter-sectoral, internationalized, essential public-utility services, public–private coordination, adherence to international standards, digital transformation, data-driven governance, KPI-based management, and accountability. International trends show a shift from compliance-based management to modern governance centered on services, data, risks, and accountability, with the application of KPI and SLA, data digitalization, public–private partnership, risk-based management, and transparency of information.

2.2.2. Contents of State Management of Maritime Safety Assurance

The contents include: (1) organization and management of the maritime safety assurance system (institutions, laws, planning, organizational apparatus, infrastructure investment, inspection, maintenance, etc.) and (2) management of the provision of public maritime safety assurance services (maritime signaling, pilotage, MSI, VTS, SAR, etc.).

Each domain is designed across three state management functions: issuance (institutions, laws, planning), organization of implementation (deployment, operation, investment, service provision), and supervision–evaluation (inspection, performance measurement, feedback, and improvement under the PDCA cycle). Through these contents, the dissertation proposes a **2 (domains) × 3 (functions)** analytical framework.

System (H): Issuance (H1), Implementation (H2), Supervision (H3)
Services (D): Issuance (D1), Implementation (D2), Supervision (D3)

2 (domains) × 3 (functions) matrix in state management of maritime safety assurance

State management function	**Organization and management of the maritime safety assurance system**	**Management of maritime safety assurance service provision**
Issuance of institutions	**H1** • Promulgate legal documents. • Plan networks of channels, lights, and stations. • Issue technical regulations for works and maritime signaling (etc.). • Issue economic–technical norms for infrastructure. • Financial mechanisms & PPP.	**D1** • Service quality standards (KPI/SLA) and business conditions. • Framework for service prices/fees/charges and financial mechanisms. • Human resource competency standards (STCW/IALA) for services. • Business conditions & licensing of training.
Organization of implementation	**H2** • Manage construction investment projects and materialize plans. • Manage maintenance and dredging for navigational channel upkeep. • Digitize and manage asset data. • Train civil servants for state management. • Organize dissemination, communication, training, etc.	**D2** • Commission/tender/assign public-utility services. • Traffic regulation & operational coordination. • Organize examinations & issue certificates (COC/COP). • Manage training institution activities. • Apply digital technologies.
Inspection and supervision	**H3** • Acceptance of construction/dredging quality. • Technical audits & environmental monitoring. • Investigate infrastructure incidents. • Inspect maintenance activities.	**D3** • Supervise compliance with SLA/KPI commitments. • Acceptance & settlement/payment for services. • Inspect actual capacity (PSC/FSC) and compliance at seaports. • Handle violations and enforce compliance. • Rank service providers & handle violations.

Source: Compiled by the doctoral candidate, 2025.

2.2.3. Evaluation Criteria and Factors Affecting State Management of Maritime Safety Assurance

2.2.3.1. Evaluation Criteria

Evaluation criteria include: effectiveness and appropriateness of institutions; capacity for organizing implementation; service quality and service levels; financial efficiency and sustainability; reflected safety and environmental outcomes; transparency, accountability, and satisfaction levels. The evaluation criteria system is linked to a set of 30 KPI indicators under the dissertation's 2×3 matrix.

2.2.3.2. Influencing Factors

Seven key factors are analyzed: institutions and laws; organizational apparatus and human resources; financial resources and technical–material facilities; science–technology and data; socio-economic context and global logistics competition; natural factors, environment and climate change; and international and regional cooperation. These factors interact multidimensionally, where strengths in one may compensate for limitations in another, but inadequacies can become bottlenecks.

2.3. INTERNATIONAL EXPERIENCE IN STATE MANAGEMENT OF MARITIME SAFETY ASSURANCE AND LESSONS FOR VIET NAM

2.3.1. Experience of Several Countries Worldwide

International experience is diverse due to differences in geography, fleet scale, and management capacity. The dissertation selects representative countries in two groups: organization and management of the system, and management of service provision.

- **Singapore:** Separates regulatory and service functions, digitizes governance, integrates data, and emphasizes accountability and risk governance.
- **Malaysia:** Centralizes regulation, grants port autonomy, and stresses coordination and supervision in PPP contexts.

- **Japan:** Focuses on high technology, risk-based guidance, and standardization, with mandatory training and KPI/SLA monitoring.
- **European Union (EU):** Implements strict standardization, cross-border data sharing, and regulatory impact assessment, reducing accidents and improving management effectiveness.
- **African countries (negative reference):** Face systemic risks, limited supervision, fragmented legal frameworks, underinvestment, and high logistics costs.

2.3.2. Lessons Learned and Limitations in Application to Viet Nam

2.3.2.1. Lessons Learned

Viet Nam should clearly separate state management from service provision, enhance transparency and accountability, and ensure consistency between system governance and service management. Investment should be risk-based, with clear standards and measurable KPIs/SLA, and a focus on transparency, accountability, and sustainable financial mechanisms. Reform must balance new investment with maintaining foundational systems and emphasize supervision and compliance.

2.3.2.2. Notes for Application in Viet Nam

Applying international experience requires adaptation to Viet Nam’s financial, technological, and institutional context. Challenges include budget constraints, non-synchronized data infrastructure, insufficiently qualified personnel, and a procedure-oriented governance culture. International models must be adjusted to fit practical realities, with gradual improvements in institutions, technology, human resources, and governance innovation.

CHAPTER 3. CURRENT SITUATION OF STATE MANAGEMENT OF MARITIME SAFETY ASSURANCE IN VIET NAM

3.1. General Overview and Methods for Analyzing the Current Situation

3.1.1. Overview of Viet Nam's Maritime Sector

Viet Nam's maritime sector is a cornerstone of the national economy, with a coastline exceeding 3,260 km and 34 seaports distributed from North to South. In 2024, port cargo throughput reached 864.4 million tons, with container volume approaching 30 million TEU and an average annual growth rate of 8% from 2015 to 2024. The merchant fleet in 2025 comprised over 1,500 vessels totaling 11 million GT, ranking fourth in Southeast Asia. The Liner Shipping Connectivity Index (LSCI) rose to 70 points in 2023, placing Viet Nam third in ASEAN and seventh globally by Q1/2024. Digital transformation has accelerated, with the National Single Window, e-Port, and VTS/AIS systems deployed in 14 areas, and smart ports such as Lach Huyen pioneering real-time data and KPI-based governance.

3.1.2. Organizational Apparatus for State Management of Maritime Safety Assurance

The management apparatus includes the Ministry of Construction (since March 2025, previously the Ministry of Transport), the Viet Nam Maritime and Inland Waterways Administration, and 18 Maritime Port Authorities. Public-utility service providers also participate under the Ministry. The merger of ministries aims to streamline coordination and improve effectiveness, but presents challenges in process standardization and change management. The Ministry's role and structure are defined by Government Decree No. 33/2025/NĐ-CP.

3.2. CURRENT SITUATION OF STATE MANAGEMENT OF MARITIME SAFETY ASSURANCE IN VIET NAM (2015–2025)

3.2.1. Current Situation of Organization and Management of the Maritime Safety Assurance System

3.2.1.1. Issuance of Legal Documents, Planning Instruments, and Standards

From 2015 to 2025, the Ministry of Construction actively contributed to policy advice and promulgated numerous decrees, circulars, and decisions to strengthen the legal framework for maritime safety management. This shift enabled program-based management, especially in maintenance, standardization, and public-utility services. However, the proliferation of documents risks regulatory fragmentation and increased compliance costs. While clear responsibility structures have been established, inter-sectoral coordination and digital data sharing remain inadequate, reducing supervisory effectiveness. Spatial regulations have defined port waters and safety corridors, but approaches remain static and insufficiently adaptive to climate change and evolving vessel density. Technical and operational standards have improved inspection and supervision, yet focus on process management rather than results management, lacking KPIs and SLA commitments. Financial mechanisms have shifted toward commissioning services, but maintenance budgets are insufficient and poorly allocated. Planning has integrated geopolitical and climate risks, but digital infrastructure planning is incomplete, lacking connectivity and synchronization. Overall, the Ministry has built a robust legal “hard framework,” but “soft frameworks” such as technical standards and flexible mechanisms lag behind practical needs.

3.2.1.2. Organization and Management of System Operation

Management has evolved from administrative to modern models emphasizing investment efficiency, accountability, and digital technology application. Infrastructure investment and operation have achieved reliability rates above 99%. Maintenance is strictly implemented but remains dependent on state budgets and

lacks non-state resource mobilization and big-data analytics for risk prevention. Asset management digitization has progressed, with full digitization of vessel registration and inspection data, and deployment of GIS, AIS, and VTS systems for monitoring and traffic regulation. However, data fragmentation and lack of interoperability persist. Training for management personnel is prioritized, but digital expertise and talent attraction remain limited. Communication and promotion of maritime safety culture have improved risk prevention and professional standards.

3.2.1.3. Supervision and Evaluation of the System

Supervision and evaluation have advanced in inspection numbers and technology application for monitoring dredging and maintenance. Nevertheless, effectiveness is limited by administrative focus, lack of technical indicators, and unsynchronized digitized data. Asset quality assessment relies on paper reports, with insufficient attention to life-cycle management and risk forecasting. Incident investigations are reactive, lacking feedback mechanisms for process adjustment. Environmental monitoring and violation handling are problematic, with weak deterrence and limited public disclosure of safety indicators. Overall, supervision and evaluation have not fully enhanced state management effectiveness.

3.2.2. Current Situation of Management of Maritime Safety Assurance Service Provision

3.2.2.1. Issuance of Mechanisms and Policies for Services

The Ministry has improved institutions, service standards, and pricing mechanisms, transitioning from administrative appointment to conditional business management. However, service quality standards focus on technical processes, lacking output indicators, KPIs, SLAs, and customer feedback. Pricing has shifted from fees to prices, but resource allocation and competition in provider selection remain insufficient. Human resource standardization is emphasized, but regulations for new positions (cybersecurity, digital technicians) are lacking. The institutional framework has created market order, but further improvements are needed in output standards, flexible pricing, and digital human resource development.

3.2.2.2. Organization of Service Provision

Public-utility service provision has shifted from assignment to commissioning and tendering, promoting competition and budget transparency. However, approval processes and tendering remain slow and unsuitable for continuous services. Commercial services such as towage have grown with private sector participation, while pilotage remains monopolistic and lacks competition and supervision. Digital technology application is focused on administrative stages, with operational processes and data not yet synchronized or interoperable. These bottlenecks reduce efficiency, innovation, and management effectiveness.

3.2.2.3. Supervision and Evaluation of Services

Inspection and supervision rely mainly on paper documentation, lacking digital technology and KPI/SLA indicators. Administrative violations are common, while technical and quality violations are rarely detected or addressed. Customer feedback, provider ranking, and sanctions are weak, failing to incentivize competition and service quality improvement. The absence of enterprise credibility assessment and market feedback data hinders optimization of management effectiveness and service quality.

3.3. QUANTITATIVE ASSESSMENT OF FACTORS AFFECTING THE EFFECTIVENESS OF STATE MANAGEMENT

3.3.1. Research Model Design

The study employs structural equation modeling (SEM) to test the impact of six groups of state management factors (issuance, implementation, supervision for both system and services: H1, H2, H3, D1, D2, D3) on management effectiveness. Hypotheses posit positive effects for each factor.

3.3.2. Research Data

Survey data comprise 250 samples representing stakeholders in the maritime ecosystem (management agencies, enterprises, seafarers, pilots/VTS personnel, lecturers/researchers), distributed by region, gender, age, and seniority, ensuring multidimensional perspectives.

3.3.3. Model Analysis Results

Reliability and validity tests show strong scale reliability (Cronbach's Alpha ≥ 0.609), high factor loadings, and satisfactory model fit indices (Chi-square/df = 1.978; CFI = 0.966; TLI = 0.95; RMSEA = 0.042). The SEM model explains 77.6% of the variance in management effectiveness. Four factors—system implementation (H2), system issuance (H1), service implementation (D2), and service supervision (D3)—have positive, statistically significant effects, with system implementation strongest. System supervision (H3) and service issuance (D1) lack clear statistical significance.

3.3.4. Discussion of Research Results

Quantitative results indicate that management effectiveness depends mainly on implementation capacity and institutional quality, while system supervision and service policy require strengthening. This informs the solution proposals in Chapter 4, focusing on enhancing implementation, transforming supervision toward risk-based and output-standard approaches, and improving service regulation mechanisms.

3.4. GENERAL ASSESSMENT OF THE CURRENT SITUATION (2015–2025)

3.4.1. Achievements

Legal frameworks and technical standards have improved, approaching international practices. The implementation apparatus has been consolidated, enabling synchronized operation of signaling, channels, infrastructure, and services. Operational effectiveness has improved, reflected in technical indicators (SLA, KPI) and reduced accident rates. Inspection and violation handling have strengthened compliance and service quality.

3.4.2. Limitations

Regulations remain overlapping and insufficiently synchronized; many are outdated relative to practical realities and international standards. Technical infrastructure, technology, financial resources, and human resources are limited and do not meet modernization requirements. Supervision and evaluation rely on administrative procedures, lack digital data, and have not shifted to risk-based governance. The public-utility service market lacks competition; pricing and contracts are not linked to output quality.

3.4.3. Causes of Limitations

Objective causes include the inter-sectoral and multi-actor nature of maritime safety assurance, technological change pressures, resource shortages, and ineffective coordination. Subjective causes include institutional inertia, fragmented interests, limited policy-making and contract management capacity, a procedure-oriented organizational culture, and insufficient innovation and digital technology application in supervision and evaluation.

CHAPTER 4. SOLUTIONS TO IMPROVE STATE MANAGEMENT OF MARITIME SAFETY ASSURANCE IN VIET NAM

4.1. NEW CONTEXT, VIEWPOINTS, AND OBJECTIVES FOR IMPROVING STATE MANAGEMENT OF MARITIME SAFETY ASSURANCE

4.1.1. New Context and the Requirement to Innovate State Management

Viet Nam’s maritime sector faces new challenges in the context of globalization, including intense international competition, geopolitical volatility, digital transformation, AI technologies, sustainable development requirements, and non-traditional risks such as cybersecurity, climate change, and supply chain disruptions. International standards on safety, environment, and services are increasingly stringent, while domestic capacity remains limited in institutions, technology, and resources. This context requires a shift from traditional administrative models to modern, flexible governance based on data, international

standards, and risk governance, while enhancing private-sector participation, international integration, and development of high-quality human resources.

4.1.2. Viewpoints for Improving State Management

State management should maintain an enabling role, focusing on policy planning and institutional development, strengthening private-sector participation, and prioritizing safety of human life and environmental protection. The focus should shift from input control to results-based governance, with data as the foundation; proactive international integration; decentralization linked with clear accountability. All management decisions must be evidence-based, transparent, and publicly disclosed, creating incentives for innovation and improving efficiency in resource use.

4.1.3. Objectives and Orientations

The objective to 2030 is to build a modern, effective, internationally integrated system of state management of maritime safety assurance that meets standards for safety, environment, service quality, and sustainable development. Orientations focus on improving institutions, modernizing infrastructure, developing human resources, and strengthening data-driven supervision and evaluation. Specific targets include reducing maritime accidents, improving technical system readiness, improving public service quality, completing digital transformation, and strengthening international cooperation.

4.2. SOLUTIONS TO IMPROVE STATE MANAGEMENT OF MARITIME SAFETY ASSURANCE IN VIET NAM

4.2.1. Solution Group for Organization and Management of the Maritime Safety Assurance System

4.2.1.1. Improving Institutional and Legal Mechanisms

A comprehensive review, standardization, and systematization are needed for legal normative documents, technical procedures, economic–technical norms, and relevant standards/technical regulations. Priority should be given to addressing overlaps, contradictions, or inconsistencies among current documents, especially among regulations of the Ministry of Construction and other related ministries and

sectors. Establishing a unified governance framework will help clearly distinguish state management functions, public service provision, and production–business activities, avoiding conflicts of interest. Data governance should be standardized by defining a minimum data catalog, coding, quality control, and interoperability among units, ensuring that operational, maintenance, and incident data are updated, shared, and effectively used system-wide. This enhances transparency, accountability, and lays the foundation for digital transformation and evidence-based governance.

4.2.1.2. Organizing Implementation of Management and Operation

Implementation should be standardized along the asset life-cycle value chain: planning, investment, operation, maintenance, and disposal. This requires developing synchronized processes, technical guidelines, and operating standards aligned with practice and international norms. Integrated governance and inter-sectoral coordination among central agencies, local authorities, and enterprises should be strengthened, especially in areas where maritime and inland waterways intersect. Digital technology application is key: establishing a digitized system monitoring center integrating operational data, maintenance, and incident warning to support early risk detection and improve governance effectiveness. Resources should be prioritized for high-risk areas, applying predictive maintenance models based on actual data, while mobilizing social resources (PPP, private capital) for technology items to reduce pressure on the State budget and increase investment efficiency.

4.2.1.3. Improving and Enhancing Supervision

Supervision should be comprehensively innovated, shifting from manual inspection to digitized supervision based on real data and performance indicators (KPI, SLA). A system supervision KPI framework should be established with indicators such as: availability rate of maritime signaling, incident recovery time, level of maintenance compliance, and channel data quality. Tools such as electronic logs, monitoring dashboards, automated alerts, and cross-party data reconciliation should be applied to detect anomalies and enhance transparency and accountability.

Risk-based inspection and supervision should be strengthened, focusing on key areas and critical routes/channels or those with incident histories. Incident investigation data should be integrated into the supervision system, with partial disclosure of indicators to create pressure for quality improvement and strengthen trust among enterprises and the public.

4.2.2. Solution Group for Management of Maritime Safety Assurance Service Provision

4.2.2.1. Improving the Institutional Framework for Services

Standardizing the maritime safety assurance service list (maritime signaling, pilotage, maritime information, etc.), developing technical standards, output quality standards, and KPI/SLA indicator sets for each type of service are essential. Pricing/unit price and budgeting mechanisms should be improved toward output-based commissioning, ensuring public disclosure and transparency of price components and quality criteria, creating incentives to enhance efficiency and accountability of service providers. Service data governance standards should be issued, specifying minimum data thresholds, connection standards, storage, and data use as the basis for post-audit, supervision, and payment, while facilitating objective and transparent inspection and evaluation of service quality.

4.2.2.2. Improving Organization of Service Provision

Designing a unified service supply-chain model is a breakthrough solution, helping separate state management functions from service provision, preventing conflicts of interest, and improving operational efficiency. Service providers should be consolidated along the value chain; coordination processes, data, and KPI/SLA should be standardized; contracts/commissioning should be innovated toward output-based approaches; prices/unit prices should be integrated with KPI/SLA and clear reward–penalty mechanisms. A “single-window data” mechanism should be established in port areas, standardizing coordination among parties (Port Authority, pilots, maritime signaling, coastal/maritime information), helping reduce overlaps, shorten processing time, improve on-site coordination efficiency and incident response speed, and improve public-utility service quality.

4.2.2.3. Building a Continuous, Real-Data- and Risk-Based Monitoring System

A minimum KPI/SLA framework should be issued for three service groups, and part of evaluation results should be disclosed by waters/port clusters to create competitive pressure and quality improvement incentives. A shift is needed from heavy ex-ante control to smart ex-post control based on digital data; user feedback should be received; financial and administrative sanctions linked to KPI/SLA should be improved; risk forecasting supervision should be developed; and comprehensive data integration should be implemented to support state governance. This helps detect issues early, address them promptly, and lays the foundation for modern, transparent public service governance oriented toward satisfaction of enterprises and citizens.

4.3. RECOMMENDATIONS

4.3.1. Recommendations to the National Assembly

Promptly promulgate a new Maritime Code to replace the 2015 Maritime Code; improve legal provisions on infrastructure life-cycle management, data governance, KPI/SLA, and sustainable financial mechanisms; strengthen thematic supervision of maritime safety and the quality of public-utility maritime safety assurance services.

4.3.2. Recommendations to the Government

Establish a national inter-sectoral coordination mechanism for maritime safety; issue coordination–decentralization frameworks, digital transformation and cybersecurity programs, medium-term financial mechanisms, and results-based budgeting. Issue decrees on maritime affairs and maritime safety assurance in a timely manner to meet new trends while awaiting promulgation of the Maritime Code.

4.3.3. Recommendations to Other Agencies

Coordinate in designing sustainable financial mechanisms, cybersecurity standards, incident response processes, coordination among local authorities–Port Authorities–operating units; ensure enterprises comply with KPI/SLA; share data; conduct retraining and international-standard capacity building; strengthen digital competencies.

CONCLUSION

State management of maritime safety assurance is a key factor in the sustainable development of Viet Nam's marine economy. The study develops an analytical framework consisting of two domains (organization/management of the system and management of maritime safety assurance service provision) combined with three functions (issuance, implementation, supervision); it uses mixed methods (qualitative and quantitative), surveys 250 samples, and conducts in-depth interviews with 25 experts. Model validation results show that the analytical framework and the effectiveness measurement indicator set with 30 core indices are consistent with Viet Nam's realities and international standards. The study identifies achievements in 2015–2025 such as improved legal frameworks, upgraded infrastructure, reduced accident rates, contributions to marine economic development, and international integration; however, limitations remain in overlapping regulations, lack of supervisory transparency, and insufficient exploitation of digital technologies. The proposed solution system, organized by the two research domains and associated KPI indicator sets, aims toward smart, modern, transparent, and accountable governance; implementation is proposed in three phases with feasible plans, roadmaps, and enabling conditions.

In theoretical terms, the dissertation proposes a 2×3 analytical framework integrating modern public governance theories to analyze, assess the current situation, and propose solutions. In practical terms, the study provides a database for assessing the current situation, comparing it with international models, and proposing a coherent and feasible solution system, contributing to international integration and enhancing national competitiveness in maritime affairs; it serves as reference material for state management agencies. In methodological terms, the dissertation uses qualitative methods combined with quantitative methods using Python software to validate the model and influencing factors...

Limitations of the dissertation include: (1) it has not been able to study the topic on the basis of a national real-data platform; new solutions require time,

substantial resources, and practical verification; (2) it has not conducted in-depth research on state management of new maritime safety assurance services, autonomous ships, green shipping, climate change, and cybersecurity. Future research directions include: (1) studying the topic using an integrated measurement indicator system incorporating real-time data on a national digital platform; (2) assessing socio-economic impacts and conducting benefit–cost analyses of solutions in practice; (3) expanding research on environmentally friendly shipping, applying AI in risk forecasting, enhancing cybersecurity, and new services.

LIST OF PUBLISHED SCIENTIFIC WORKS

1. Pham Quang Giap, Nguyen Ngoc Toan (2025), The "2 contents - 3 dimensions" integrated theoretical framework in state management of maritime safety assurance, Economy and Forecast Review, Ministry of Finance (e-ISSN 2734-9365), No. 9002, September 2025 (32393).

2. Pham Quang Giap, Nguyen Ngoc Toan (2025), International experience on state management models for maritime safety assurance and implications for Vietnam, Economy and Forecast Review, Ministry of Finance (e-ISSN 2734-9365), No. 1001, October 2025 (32402).

3. Pham Quang Giap, Nguyen Ngoc Toan (2025), Solutions to improve state management of maritime safety assurance in Vietnam by 2030, with a vision towards 2045, Economy and Forecast Review, Ministry of Finance (e-ISSN 2734-9365), No. 1001, October 2025 (32410).

4. Pham Quang Giap, Nguyen Ngoc Toan (2025), The current organization of maritime safety assurance in Vietnam, Journal of Economics and Management, Ho Chi Minh National Academy of Politics (ISSN 1859 - 4565), No. 86, October 2025 (pp. 52-58).

5. Pham Quang Giap, Nguyen Ngoc Toan (2025), State management of new maritime safety assurance services in Vietnam in the digital era and global integration, Vietnam Finance Review, Ministry of Finance (ISSN 3093-3390), No. II, October 2025, (pp.121-pp126).