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**SUMMARY OF DISSERTATION**

**Title:** *“Establishing The Collision Risk Assessment Model in Vungtau seaport, application in maritime accident prevention, supporting the renovation and upgrading of navigational channel”.*

**Department:** Maritime Science

**Code:** 9840106

**Ph.D. student:** Le Van Thuc

**Batch:** 2016-2019

**Name of supervisors:**

1. Assoc. Prof. PhD. Nguyen Van Thu

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**Training institution:** Ho Chi Minh City University of Transport

**1. Summary of Dissertation**

According to Decision No. 1579/ QD-TTG dated Sept. 22, 2021, by the Prime Minister, the Vungtau seaport was classified as a “special seaport” and had a role as a “sea gate” port of Viet Nam. In reality, the marine traffic density in this area is the highest, and the statistical data also indicates that the numeral and frequency of accidents in this area are among the highest in the country.

Chapter 5 of the SOLAS Convention, 1974, as amended, regulation 13, requests the Contracting Governments to provide such aids to navigation, as the volume of traffic justifies and the degree of risk required. Once the degree of the risk exceeds the safety limit, then the Contracting shall provide (as it deems practical and necessary) such assistance to navigation as the volume of traffic justifies and the degree of risk requires. Therefore, as a role of a Contracting Government and based on the volume of traffic as well as the high risk of collision in Vungtau seaport, we need to study and identify a suitable model or tool to quantitatively assess the accident risk in Vungtau seaport or another important seaport in Viet Nam. Although there are many marine risk assessment models which have been researched and applied around the world, none of those are suitable for the Vungtau seaport area. Originating from a practical requirement for a specific safety management tool/ measure which is compatible with the “special port” area, it is crucial to study and develop “The Collision Risk Assessment

Model in Vungtau seaport” so that solution(s) to reduce risk and enhance the safety of navigation can be determined and implemented.

Based on the results of collision investigation and causal analysis, the Ph.D. student has found that the main factors that lead to a marine collision at Vung Tau seaport are: Current, Wind, Risk of collision when vessels are in a head-on situation; Risk of collision when vessels are in crossing situation, and finally the Human factor (which is accounted for over 80% of cases and listed as the highest reason for the marine collision,). Since other popular marine risk assessment models are not suitable to apply in Vungtau seaport and there is insufficient access to the human factor, the Ph.D. student has used the indirect method to determine the level (value) of risk of collision appropriate to Vungtau seaport conditions and then developed a mathematical formula to assess the risk of collision; a quantitative risk assessment Fast Simulation software was also developed by using AHP model in combination with the expert method to determine the values of other factors affecting the risk of collision and application of C++, etc. On the other hand, since the fuzziness (human factor) is a common feature in decision-making problems, the Ph.D. student has chosen an additional method to analyze and assess the risk of collision based on Fuzzy Logic and simulation software on Matlab (Matrix Laboratory) which allows a decision-maker to express the approximation of input data was developed, the software then verifies and evaluates the results through 11 observed maneuvering scenarios. As the result of the research, the collision risk assessment model is found to be suitable and is highly recommended for practical use in Vungtau seaport.

## **2. Objectives**

In order to build fast-time simulation software that assesses the risk of collision, application for maritime accident prevention, and support the renovation and upgrading of the navigational channel, it is necessary to study and establish an appropriate Collision Risk Assessment Model for the seaport of Vung Tau. However, this model must also satisfy the requirements for managing and developing seaports.

## **3. The subject and the scope**

- The subject: Focus on bringing up the maritime safety requirements of the target group of vessels, which includes river boats and fishing boats as well as seagoing vessels, towing vessels, and vessels operating in Vung Tau seaport. In addition, studying and evaluating the impact of the maritime environment on the operation of vessels.

- The scope: Survey, statistics, and analysis of factors related to maritime safety for vessels in Vung Tau seaport.

## **4. Research methodology**

The dissertation employed the following approaches:

- Theoretical;
- Empirical (collecting and analyzing the seaport data in combination with the expert method and scientific observation method);
- Mathematical.

### **5. New contributions to the dissertation**

- Building a modern, comprehensive, and incredibly effective database for the seaport of Vung Tau.

- Introducing the scientific hypothesis and approach to evaluate the danger of collision by determining the amount of difficulty that ships experience when navigating in a particular traffic situation.

- Determining the mathematical formula representing the risk of a collision in Vung Tau seaport and identifying the five most important factors that increase the probability of a collision.

- Examination of the risk of collision including human psychologies factor and analysis methods based on fuzzy logic, developing a proposed model and simulating on Matlab to test.

### **6. Research outcome and scientific, practical significance:**

- A fast-time simulation software is constructed as the outcome of the dissertation; the software can simulate and visually assess the risk of collision, which can be applied in accident prevention or improving, upgrading the navigation channel in Vungtau seaport. The research's methodology and its results can be used for further study to develop compatible models for other seaports in Viet Nam.

- The dissertation's results and conclusions, recommendations contribute positively to the field of maritime legal theory as part of the overall development of the Viet Nam legal system. Simultaneously, the dissertation also meets the requirement for an additional safety managing tool in Vungtau seaport – “an international container hub, a seagate” – which is one of the two “Special seaports in Viet Nam according to the master plan on development of Viet Nam seaport system to 2030, vision to 2050 approved by the Prime Minister at Decision No.1579/QD-TTg dated Sept. 22, 2021.

### **7. Dissertation Structure**

The dissertation content consists of the Introduction, 05 Chapters, and the “Conclusion, limitation and future works” as follows:

- Introduction.

- Chapter 1. Analyzing collision risk assessment models in national and international.
- Chapter 2. Summarizing and analysis of the data collected in Vung Tau seaport.
- Chapter 3. Proposing and establishing the risk assessment mathematical model in Vung Tau seaport.
- Chapter 4. Evaluating the mathematical model by the AHP method and specifying the fast time simulation to assess the risk of collision.
- Chapter 5. Based on fuzzy theory, simulating the proposed model included fuzzy functions on Matlab software to assess the risk of collision.
- Conclusion, limitations, and future works.

*Ho Chi Minh City, August 31<sup>st</sup>, 2022*

**Supervisors**

**PhD. Student**



**Assoc. Prof. PhD.  
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