10-31-2022

Exploring and validating risks related to containerization: lessons for Vietnam

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EXPLORING AND VALIDATING RISKS RELATED TO CONTAINERIZATION: LESSONS FOR VIETNAM

By

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A dissertation submitted to the World Maritime University in partial fulfilment of the requirements for the award of the degree of

MASTER OF SCIENCE
in
MARITIME AFFAIRS

(MARITIME SAFETY AND ENVIRONMENTAL ADMINISTRATION)

2022

DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views and are not necessarily endorsed by the University.

(Signature): 

(Date): 19th September, 2022

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ACKNOWLEDGMENTS

First and foremost, I'd like to express my gratitude to World Maritime University for allowing me to enroll in the Master's degree in Maritime Safety and Environmental Administration. I'm ecstatic to be a student at World Maritime University. The World Maritime University is the premier location for professional maritime training, teaching, and research. This is the most excellent place for me to learn about naval matters and gain experience. Surprisingly, the professional abilities I've acquired have given me the confidence to contribute to my country's maritime industry in the future.

Second, I want to express my heartfelt gratitude to the ITF Seafarer's Trust organization for providing me with the opportunity to study and live in Sweden. I am pretty grateful to be a scholarship student for the organization. Along with my important information and experience gained during the journey, I am eager to assist enhance and promote the required and equitable support for seafarers in my country and worldwide.

Third, I'd like to thank the Vietnam Maritime Administration and the Ho Chi Minh City Maritime Administration for nominating me for the MSc program in Maritime Affairs - Maritime Safety and Environmental Administration.

Fourth, I'd like to express my gratitude to Professor Raphael Baumler, LCDR Rebecca Sheehan, and LCDR Bryan Watts who assisted me with my thesis research and taught me a lot. Throughout the course, they gave me valuable knowledge and inspiration to complete the assignment.

I'd also like to thank my participants, who shared their documents, experiences, and perspectives with me and volunteered to participate in interviews as part of my research.

Finally, I'd like to express my heartfelt appreciation to my family and my lovely girlfriend. I'd also like to thank all of my friends at World Maritime University for their encouragement and willingness to share everything with me during my stay here.

ABSTRACT

Title of Dissertation: **Exploring and validating risks related to containerization: Lessons for Vietnam**

Degree: **Master of Science**

With the rapid development of the container industry, the container possesses many problems due to its confidential nature. This study aims to understand the danger of containerization, determine the importance of containerization knowledge, and propose the most efficient recommendations for Vietnam to mitigate these risks.

The study is based on a review of existing risks such as misdeclaration, undeclared dangerous goods, smuggling, illegal immigration, and others known worldwide. In addition, the study also conducts interviews with stakeholders participating in the flow of containers to gain their professional perspectives on the issues.

Through the research, many gaps and challenges have been pointed out, such as the lack of willingness to develop robust monitoring capacity and systems with efficient penalty systems when breaching rules; or insufficient investment in technology and humans to generate protective layers.

This paper suggested that Vietnam should strictly eliminate the act of intentional false declaration by the shipper with heavy methods such as a hefty penalty of money, creating a certificate for identification, and investing in weighting and verification systems.

KEYWORDS: Container, Exploring, Misdeclared, Risks, Shipper, Undeclared Dangerous Goods, Validating, Vietnam

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LIST OF ABBREVIATIONS

BIFA	British International Freight Association
BSU	Federal Bureau of Maritime Casualty Investigation
BUNKER	International Convention on Civil Liability for Bunker Oil Pollution Damage
CCC	Sub-Committee on Carriage of Cargoes and Containers
CIAIM	Comisión Permanente de Investigación de Accidentes e Incidentes Marítimos
CLC	International Convention on Civil Liability for Oil Pollution Damage
CPPI	Container Port Performance Index
CSC	International Convention for Safe Containers
CSS	Code of Safe Practice for Cargo Stowage and Securing
CTU	Cargo Transport Units
EU	European Union
EVFTA	The Eu–Vietnam Free Trade Agreement
FMEA	Failure Mode and Effects Analysis
FUND	International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage
HNS	Hazardous and Noxious Substances
IAPH	International Association of Ports and Harbors
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organization
ISO	International Organization for Standardization
IT	Information Technology
MAIB	Marine Accident Investigation Branch

MARPOL	International Convention for the Prevention of Pollution from Ships
MSC	Maritime Safety Committee
PRA	Port Risk Management
SOLAS	International Convention for the Safety of Life at Sea
SSIT	Sp-Ssa International Terminal
TCHP	Tan Cang Hiep Phuoc
TCIT	Tan Cang – Cai Mep International Terminal
TEU	Twenty-foot Equivalent Unit
UNCTAD	United Nations Conference on Trade and Development
UNECE	United Nations Economic Commission for Europe
UNODC	United Nations Office on Drugs and Crime
US	United States of America
VGM	Verified Gross Mass
VINAMARINE	Vietnam Maritime Administration
WSC	World Shipping Council

CHAPTER 1 INTRODUCTION

The author will describe the problems generated with the aim, objectives, and research questions in this chapter.

1.1 Background and problem statement

History has shown that the transportation business reflects human life's scientific and technical revolutions. There have been three scientific and technological revolutions in the transportation business thus far. The First scientific-technical revolution, typified by applying steam engines to transportation tools, occurred around the turn of the nineteenth century (Salomon, 1984). The Second used electric power to create mass production through out the whole chain of supply. At the close of the twentieth century, the transportation sector began to use a specific transport equipment called a container to transport goods, thanks to the introduction of internal combustion engines and electric motors (Petrescu, 2015). The increasing use of containers in transportation has dramatically altered many elements, not just in the transportation business but also in other economic sectors that require the transportation of goods (Tseng et al., 2005). Moving goods by container is highly efficient from a socioeconomic standpoint. As a result, cargo containers are a component of the transportation industry's Third scientific-technical revolution.

Vietnam's seaport system in recent years has developed synchronously and modernly to welcome the world's largest seagoing ships. The seaport system can meet the needs of vessels entering and leaving the port; the time for ships to wait for the bridge is minimal, meeting through import and export goods and domestic transportation. There is excellent potential for developing a large fleet in light of the current state of the international transport market and the volume of goods moving through Vietnam's seaports, both of which tend to increase over the years. Despite this, some risks are still associated with using containers, a common form of cargo transportation.

For example, the accident with the cargo ship Deneb in the port of Algeciras (Spain) capsized while loaded on deck on June 11, 2011. According to the investigation, 16 containers have actual volumes exceeding four times the declared volume (CIAIM, 2012). In early 2007, after a storm hit the MSC Napoli, the ship damaged its frame structure, was heavily tilted, and could capsize at any time. This spilled 200 tons of oil into the sea; in addition, 200 containers fell from the ship's side, including containers containing dangerous goods such as acid batteries, perfumes, and specialized gas bottles. About 660 containers loaded on deck were weighed after the incident, and 137 containers (accounting for 20%) have an absolute difference of 312 tons compared to declare (MAIB, 2008). Although SOLAS has stipulated the correct declaration of Verified Gross Mass (VGM), this problem can still occur if the shipper and the ship do not play by the rule; this further can seriously affect the lives of seafarers onboard the vessel.

This is just one of the dangers associated with containerization. These hazards can have enormous consequences and affect many stakeholders. The study of this issue is a requirement in the context that Vietnam is developing a fleet of container ships for international operations.

1.2 Literature review

The dramatic increase in e-commerce, as consumer demand booms during the pandemic, increases the urgency for shipping lines to deliver products as quickly as possible. Because of the demand, cargo ships are increasingly "risking their lives" to exchange for time in transportation, leading to increased accidents involving ships, especially container ships.

The risks raised by container movements in ports were reported by Pallis (2017). Similar findings were also found in Alyami et al.'s (2019) study. However, both studies took different approaches to evaluate the problem. Various methods, such as Port Risk Management (PRA) and Failure Mode and Effects Analysis (FMEA), are used to assess operational risks at container terminals. Many issues had been categorized: humans, technical, environment, etc. The commonly reported risks are all related to human errors such as crane breakdown due to human error, the person handling dangerous goods in containers that have not been declared (Alyami et al., 2019), or 92 total human incidents over the period 2008-2011 at two Greek container terminals

(Pallis, 2017). These studies have pointed out some existing risks, but there is no insight into the causes.

The main risk lies in the uncertainty of the container. Some of the dangers, such as misdeclaration and illegal transport, were mentioned in Baumler's (2013) article. Similar reports by Brennan (2019), Fedi et al. (2019), King (2016), and Smith (2017) also pointed out the risks that the container industry had to face. Drug smuggling has been a significant problem that has harmed the national economy and public safety (Smith, 2017). Five seafarers died following an accident in the Gulf of Aden involving a misdeclared dangerous container shipment, and an estimated $1 billion in damages were incurred (Brennan, 2019). Although the International Maritime Organization (IMO) had already had a Convention for Safe Containers (CSC) and later the amendment regulation for the VGM in SOLAS, accidents regarding the problems still occur regularly. Although some studies provide a broader perspective and solution to the issues, such as risk containers (Leigh et al., 2021) and IT systems for weighing containers (Fedi et al., 2019), these methods require a highly invested infrastructure.

In Vietnam, very few shipping companies give instructions about container overweight and its consequences. Furthermore, according to a report by the General Customs Department, hundreds of forbidden goods are smuggled through container shipping. In short, Vietnam has a gap in risk related to container study. Future research could explore the cause and effect of each issue and propose collaboration solutions between parties such as the port administration, the shipping company, the maritime administration, and the competent authorities.

1.3 Aim and objectives

This study aims to understand the danger of containerization and obtain the perception of relevant stakeholders to the process. To achieve this, three research objectives are proposed as follows:

- To identify the risks related to containerization
- To determine the importance of containerization knowledge as perceived by relevant parties
- To discuss the role of collaboration between parties in Containerization and container inspection

1.4 Research questions and hypotheses

To better facilitate and establish the study's objectives, the research is looking to answer the following research questions:

- What are the causes and consequences of Containerization?
- What is the level of awareness between parties toward the danger?
- Where is the cooperation for the container inspection in relevant stakeholders' policy?

CHAPTER 2 RESEARCH METHODOLOGY

The author will explain how the data was gathered and processed in the section that is devoted to the methodology. The objective of this chapter is to explain the reasoning behind selecting specific approaches to employ in this thesis.

2.1 Research approach

The inductive research method was used during the course of this investigation. Inductive reasoning is a type of logical reasoning in which you draw conclusions based on observations and knowledge from prior experience. This method combines observations and practical experiences to forecast expertise and the degree of risk issues containers will bring.

You can work with a variety of probabilities when using inductive reasoning. Numerous inferences can be drawn from the available information. However, using inductive reasoning will give you a place to start so that you can focus on your assumptions and reach a well-informed conclusion. You can develop several solutions to a problem using inductive reasoning and use your research as a base to assess another hypothesis. It enables you to use information from prior experience to make judgments and decisions in novel circumstances.

One weakness of inductive reasoning is one of its most significant strengths — you can only form theories based on limited information or knowledge. While it opens up an opportunity for you to explore, it also limits the resources you can use. For instance, you might conclude that every cat will hiss at dogs if you observe 100 cats and notice that they all hiss at dogs. Even though this is a good excuse, your sample set is currently constrained. Because not all cat species worldwide fall under the definition of the number 100.

Realizing that error is inevitable is crucial when using inductive reasoning. Even though your hypothesis or theory might not be accurate in some instances, you can still use that knowledge to advance your investigation.

2.2 Qualitative Research

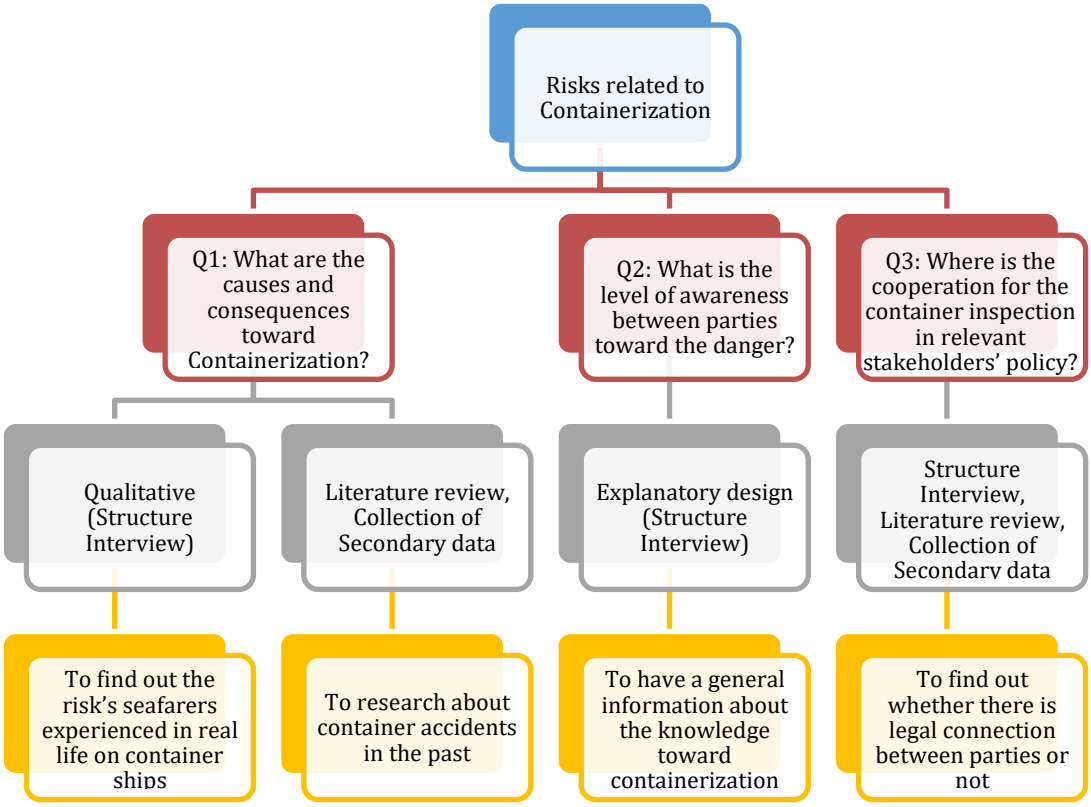
Qualitative data gathering uses social aspects and works to build methods that can locate and map processes (Morrison & Knudson, 2002). The purpose of this research is to create a map of the current flow of containerization risks and the issues that are associated with that flow.

Interviews are the primary means through which the required data may be gathered. Through interviews, the author will compile real-world knowledge and the perspectives of those involved in and impacted by the flow of containers. Higher accuracy and efficiency will result from considering the current situation and projecting future outcomes when developing solutions based on the data gathered.

The acquisition of secondary data allows for the gathering of more information as well as the validation of previously qualitatively obtained data.

Figure 1

Flow chart of data collection



Note. From Author

This paper seeks to contribute to an enhanced knowledge environment for relevant parties and better container flow, which, when combined, will result in better safety and convenience of container transport. The analysis flowchart shown in Figure 1 illustrates the research task carried out in the report. To come closer to the study goals, the author concentrate their efforts primarily on the data collecting and analysis aspects, which are supported by theoretical justification. The data collecting process includes a literature review on legislation, interviews, and several other forms of secondary data.

2.3 Data collection

Data may be separated into primary and secondary sources. Most of the information used in this thesis comes from primary data sources, although the part is also derived from secondary data sources.

- Primary data are the results of the researcher's initial collection efforts and may include surveys and interviews. In this work, 14 interviews were conducted.
- The term "secondary data" refers to previously gathered information from another source. Before conducting interviews, the secondary sources were studied and analyzed so that the researchers would be prepared with the appropriate questions to ask participants during the interviews. In addition, the container's documentation, rules and regulations, statistics, and control circumstances make up the bulk of the secondary data in this investigation. Literature, laws and regulations, publications, statistics provided by relevant authorities, earlier research, and the official websites of the competent agencies were some of the sources used to gather secondary data.

Interviews with key employees engaged in the movement of containers are the primary source of primary data.

Due to the limited time available and the great distance from the interviewee, most of the interviews were conducted online. Face-to-face interviews were only used for a small fraction of the full interviews. Face-to-face interviews, on the other hand, were favored above different types of interviews since they result in the disclosure of more information. Some aspects that may provide input to the interview include facial expressions, body language, and the working environment; however, gathering any of these factors while doing an interview online is not feasible.

Depending on the interviewer's preference, an interview may be either organized or unstructured. When conducting a structured interview, the interviewer will ask a series of questions prepared in advance. This objective ensures that all interviews are shown in the same setting. So, it's straightforward to construct a summary of all the interviews to compare the results. An unstructured interview is often used to help the interviewee open up, allowing for a more free-flowing discourse. Unstructured interviews employ a minimal outline with a few general questions. Because it was required to compare the material from the interviews, they were entirely or partly organized. The majority of interviewees have experience handling containers.

The overarching goals of the interviews are to provide an accurate picture of all the dangers associated with containerization and identify issues. Another objective is to

evaluate how effectively rules and regulations are implemented in reality and identify problems related to today's application environment.

A total of 14 interviews, as shown in Table 1, with stakeholders from throughout the whole transport chain were undertaken.

Table 1

List of coding

Code	Age	Gender	Professional Background	Reason for choosing
L_1	29	Male	Custom Declaration Officer	He has been working with the custom for five years.
L_2	31	Male	Sea Export Supervisor	He has been an expert with the Sea Export Operation for six years.
M_1	47	Male	Ship Management	He has been an expert in shipping management for container fleets for five years.
M_2	41	Male	Deputy Ship Management	He has been an expert in shipping management for container fleets for ten years.
P_1	38	Male	Manager of Operation Department	He has been engaged in the container port operation for seven years.
P_2	40	Male	Deputy Director of Port Operation Department	He has been engaged in the container port operation for four years.
P_3	45	Male	Algeria General Manager of Port's Directors	He is an expert with 25 years of experience in port operation.

P_4	39	Male	US Coast Guard	He has been an officer in the Coast Guard for 17 years.
O_1	38	Male	Ship Master	He has been the captain of the container vessel for five years.
O_2	35	Male	Ship Master	He has been the captain of the container vessel for three years.
O_3	36	Male	Deputy Head of Operation Department	He has been engaging in container operation for two years.
O_4	39	Male	Ship Master	He has been the captain of the container vessel for four years.
O_5	41	Male	Ship Master	He has been the captain of the container vessel for ten years.
O_6	50	Male	Ship Master	He has been the captain of the container vessel for ten years.

Note. From Author

2.4 Reliability

The term "reliability" refers to how effectively the research and the tools used for data collecting can withstand the effects of random chance. When many separate observations of the same phenomenon provide findings that are the same or nearly equal, we may say that we have attained a high level of dependability (Merriam, 2009). Because the facts depend on individuals' thoughts and perspectives, it is more challenging to regulate whether or not they are reliable. The human element is a significant consideration, and how interviewees respond to questions may vary from time to time since situations and perspectives are subject to change (Best & Kahn, 2006). Some respondents may misunderstand or misinterpret the questions, which poses a risk to the dependability of the results. The respondents themselves have some responsibility for the possibility of poor reliability, but the subsequent analysis phase is also impacted by this possibility (Bush, 2012).

In this study, the author use cross-checking to reduce the effects of chance (Merriam, 2009). Similar interview questions are utilized when interviewing various players involved in the container operation. However, the questions are phrased in such a way as to provide varying priorities and attention based on the position and function of the respondents (Best & Kahn, 2006). The fact that the knowledge domains of the questioned actors often overlap has also contributed to an increase in dependability. This is because it provides the author with the opportunity to regulate the information that was obtained from earlier interviews that were carried out. In the meantime, the author has also updated each set of upcoming interview questions based on the feedback from the interviews that have already taken place.

Furthermore, contradictory feedback from the same questions will be picked out from the interviews that have already taken place and applied to the new questions (Bush, 2012). In addition, every interview is recorded with the agreement of the person being interviewed to minimize the amount of information that is misconstrued. During the interviews, no questions of a sensitive nature were asked, and the interviewees had the option of remaining anonymous if that was more comfortable for them. The vast number of interviews, the lack of technical computations, and the author' experience have all contributed to the study's high level of trustworthiness.

CHAPTER 3 NATURE, CHARACTERISTICS, AND RISKS

In this chapter, the author will describe the container's nature and the risks generated from that nature through a literature review.

3.1 Nature and characteristics of container

People have reaped several advantages from the invention of containers, including considerable cost reductions when those containers are paired with other transportation modes like trucks and boats (Behar & Venables, 2011). When it comes to moving large numbers of products, this aspect of the method of transportation becomes more workable as a result (Levinson, 2006). Today, with a network of container transportation networks encompassing the whole globe and incorporating many modes of transport, the container transportation industry has assumed an important position in the functioning of the global economy (Saxon & Stone, 2017). It is vital to remember that container shipping and transportation need significant labor from shipping lines, ports, or container leasing firms, all of which are highly influential intermediate organizations that do forwarding (Levinson, 2006). Indicators are also used to assess the market for container shipping. However, at the moment, in the fields of shipping and container transport, there is no unified index to evaluate precisely like in other types of shipping; however, respectable brokerage and consulting firms are working to provide their indicators, such as the indexes of Howe Robinson, Braemar, and Maersk Broker.

A cargo container is equipment of transportation that has all of the following qualities (IMO, 2022b):

- Able to withstand continued usage due to its durability and strength.
- Equipment that enables comfortable handling has been installed, particularly to transition between different modes of transportation.

- Specifically engineered to allow for the transportation of products by one or more modes of transportation (such as ships, trains, or specialized vehicles) without the need for the commodities to be operated again along the route.
- Developed to make the operating of containers as simple as possible (IMO, 1996).

The term international standard containers (ISO containers) are commonly encountered which are cargo containers (as above) that comply with all relevant ISO standards on containers. It is in effect at the time of container production.

3.2 Risks related to container

3.2.1 Misdeclaration, Overweight

The most significant risk to container transportation is posed by incorrect declarations, which have also been connected to substantial financial losses (Lloyds, 2014). One observer has compared the magnitude and impact of misdeclarations to the number of ships lost during the Victorian period, contributing to the load lines' creation. Of the 660 containers that remained on the deck of the MSC Napoli, 20% were more than three tonnes above their declared weight (Porter, 2018). This was not why MSC Napoli broke up but represented an undoubted safety concern. Shippers, often known as the people who deliver the goods, are responsible for filling out the shipment paperwork, including the insides and weight of each container. When the actual weight varies from the claimed weight, this is an example of misdeclaration. It is possible to reduce shipping costs by reducing the container volume while maintaining the same weight. In addition, the number may be fake, or it may not consider the tare weight or the dunnage weight of the container. The use of containerization helps speed up the transportation of goods throughout the supply chain. The quicker containers are transported, mainly via ports, the more effectively ships are employed, resulting in lower freight costs (Yahalom & Guan, 2018). As a result, there is tremendous pressure to get containers through ports as quickly as possible (Baik, 2017). As shown in Figure 2 and Figure 3, the average time in the port of a container vessel is the lowest of all types of vessels all over the world and around 0.71 (days). There are limited possibilities to conduct shipper disclosure verification with this short time in port for container ships.

Figure 2

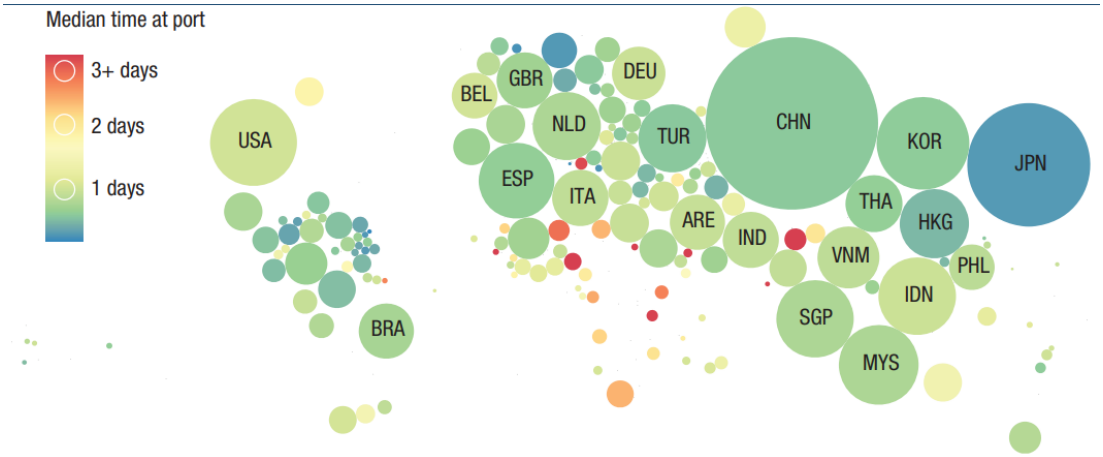
Time in port, age, and vessel sizes, by vessel type, 2020, world total

Vessel type	Median time in port (days), 2020	Median time in port, % change over 2019	Average size (GT) of vessels	Average age of vessels	Maximum size (GT) of vessels	Average cargo carrying capacity (dwt) per vessel	Maximum cargo carrying capacity (dwt) of vessels	Average container carrying capacity (TEU) per container ship
Container ships	0.71	2.3	38 308	14	237 200			3 543
Dry break bulk carriers	1.15	4.3	5 439	21	91 784	7 405	116 173	
Dry bulk carriers	2.07	2.7	32 146	14	204 014	57 453	404 389	
Liquefied natural gas carriers	1.12	0.8	95 270	12	168 189	74 229	156 000	
Liquefied petroleum gas carriers	1.04	3.0	10 826	15	59 229	12 164	64 220	
Wet bulk carriers	0.97	3.9	15 704	14	234 006	27 242	441 561	
All ships	**1.00**	**2.9**	**14 663**	**18**	**237 200**	**24 956**	**441 561**	**3 543**

Note. From "Review of Maritime Transport, 2021", by UNCTAD, 2021, p.90. Copyright 2022 by UNCTAD. Ships of 1,000 GT and above. Not including passenger ships and Ro/Ro vessels.

Figure 3

Container ship port calls and time in port, 2020



Note. From "Review of Maritime Transport, 2021", by UNCTAD, 2021, p.90. Copyright 2022 by UNCTAD. Ships of 1,000 GT and above. Labelled countries had more than 5,000 container ship port calls in 2020.

Most attention is paid to "overweight" containers, where the reported weight is less than the actual weight, although an overstated weight can also be problematic (BIFA, 2015). In addition, for this to be a problem, the container doesn't need to be packed

to an extent exceeding the approved capacity. The distortion of its weight is an essential factor to consider. Containers loaded to their maximum capacity continue to cause worry, particularly 40-foot containers, which are susceptible to overloading even when carrying reasonably densely packed material. A ship cannot transport several containers more than its authorized capacity. As a result, they are more likely to have their status misrepresented. In recent years, many losses have been caused by the submission of bogus claims.

The MOL Comfort fell apart and sank in 2013 when it sailed off the coast of Yemen. Although the proof could not be located, the official investigation investigated the possibility that incorrectly stated containers were involved in the incident. An analysis of similar vessels found inaccurate and precise estimates of their weights. Around 1629 shipping containers are misplaced at sea owing to factors other than natural catastrophes annually (WSC, 2022). In the month of November in the year 2020, a storm in the Pacific Ocean caused the 14,000 TEU ONE Apus to lose more than 1816 containers overboard (Baker, 2022c). The possibility exists that inaccurate declarations were a factor in the event; however, this could not be shown.

Although the CSC 1972 mandates that maximum burdened weights be defined (and printed on the container), this does not provide a complete solution to the issue. This is because a container may be legal on paper, but the number is different, resulting in unsafe stowage. The stowage of a ship is the responsibility of the ship's master, who must ensure that the vessel is not overloaded and in a balanced state. It is impossible for masters to correctly trim the containers if they are not aware of the actual weight of each one.

Overweight containers should not cause the ship to become overburdened. This is because the whole weight of the vessel may be monitored independently using its load lines, and these load lines must not be submerged. However, this causes further problems when the container is overloaded. Due to unstable container stacks or incorrect load distribution, the ship can be subjected to stresses that surpass its design capabilities. This has the potential to make a vessel bend or perhaps break in two. The ship's structure increases the risk of cumulative damage (MAIB, 2008).

Deck-stacked containers with inaccurate weight estimates make the challenge far more complex. Their influence was multiplied in direct proportion to their height. On

the other hand, having containers at the bottom of the stack with inflated weights might also be troublesome. Because modern container ships can carry more cargo on their decks than their ancestors could, they are more likely to encounter problems with container weight misdeclaration. An estimated one-third of the 150 million containers delivered annually have incorrectly stated weights (Wackett, 2014).

In addition, overweight containers cause an increase in costs, a loss in ship efficiency (which leads to environmental pollution), delays, and disruptions to schedules. Moreover, port operations are at threat. In a poll conducted by the International Association of Ports and Harbors (IAPH) in 2012 on overweight and incorrectly stated containers, 91 percent of respondents mentioned "terminal accidents" as a potential risk (IAPH, 2012).

3.2.2 Undeclared dangerous goods

Despite the existence of legislation and instructions for the transport and handling of hazardous materials, accidents and incidents still occur. Mis- and non-declaration of cargo has severe safety implications and is the root cause behind these tragic incidents (Baker, 2019). Understanding them may aid in preventing future events of a similar nature. In 2019 and 2020, several high-profile fires have been aboard container ships carrying hazardous materials. On board the container ships Yantian Express, APL Vancouver, and E.R. Kobe, there was a widespread suspicion that the fires that broke out were started in containers that contained hazardous products that were either mislabeled or not disclosed (IMO, 2019a). Calcium hypochlorite may have started a fire on APL Austria in 2017 (Dixon, 2017). Significant fire/explosion occurrences have been related to undeclared dangerous goods onboard vessels such as Maersk Honam, MSC Daniela, and CCNI Arauco, as shown in Table 2.

Table 2

List of selected fire accidents on container vessels from 2016 to 2019

Name	Size	Year	Type of Accident
CCNI Arauco	9,030 TEU	2016	Container Fire
MSC Daniela	14,000 TEU	2017	Container Fire
Maersk Honam	15,226 TEU	2018	Container Fire
Yantian Express	7,510 TEU	2019	Container Fire
APL Vancouver	9,200 TEU	2019	Container Fire
E.R. Kobe	5,700 TEU	2019	Container Fire

Note. Synthetized from Lloyd's List by Author

Table 3

Container fire accidents were reported in 2021 and 2022

Name	Size	Date	Type of Accident
X-Press Pearl	2,700 TEU	19/05/2021	Container Fire
Ocean Trader	210 TEU	08/06/2021	Container Fire
MSC Messina	2,479 TEU	25/06/2021	Container Fire
Zim Kingston	4,253 TEU	22/10/2021	Container Fire
Euroferry Olympia	33,588 GT (Ro-Ro)	18/02/2022	Container Fire
Zim Charleston	8,586 TEU	08/08/2022	Container Fire

Note. Synthetized from Lloyd's List by Author

Due to their size and location, major containership fires from the previous year, like those on the X-Press Pearl (Osler, 2021) and Zim Kingston (Shen & Baker, 2021) as shown in Table 3, made front-page news. The 102 TEU Ocean Trader's master and several crew members were reportedly fined and suspended prison sentences after

a container carrying peroxide exploded at Jebel Ali due to fumes being allowed to accumulate (Walia, 2021). The fire was also generated from containers on 153 trucks and trailers onboard the Euroferry Olympia; recall the December 2014 ferry fire in the Adriatic, where at least 12 people died aboard Norman Atlantic (Lowry, 2022). Recently, the 8,586-TEU Zim Charleston reported a fire en route between Singapore and Colombo, affecting 300 containers (Baker, 2022b). As the ship gets bigger and bigger, containership fires can be dangerous and devastating. According to the newest maritime safety report (Inmarsat, 2022), the number of container accidents from 2018 to 2021 is consistent at around 29 to 38. This statistic means that although the size of the vessel is becoming bigger and bigger day by day, the number of accidents remains the same. This can generate subjectivity in the maritime industry as the method for dealing with a fire on a large vessel is not comprehensive. Additionally, even on giant box ships, crew members must only have the most basic training to handle specific risks (Baker, 2021b).

The problems also lay with the container that is abandoned at the port. Abandoned cargoes, mainly if they include dangerous goods, remain a risk to the containerized freight sector, with a worst-case scenario leading to a disaster or explosion. “There are reasonable causes, such as insolvency or loss of market, and aggravated causes, where something gets stuck in the process, possibly due to a regulatory impasse. Then there might be illicit trade of counterfeit and contraband,” said TT Club risk management director Peregrine Storrs-Fox (Baker, 2021a). In 2015, an explosion caused by a ship carrying hazardous chemicals resulted in 44 casualties near Tianjin port (Leander, 2015). Massive destruction appeared after 2,750 tonnes of ammonium nitrate exploded, causing the death of 100 people in Beirut’s port (Watkins, 2020). A fire and explosion at an inland terminal in Bangladesh, driven primarily by the transport and storage of dangerous goods in containers, resulted in the deaths of at least 49 people (Baker, 2022a). For some forms of transportation, there were international, national, and local regulations in place; however, there was no direct equivalent for warehouses and inland terminals.

To investigate the factors that led to fires and explosions that occurred in the marine transportation industry between the years 1990 and 2015, Baalisampang et al. (2018) performed a study of accident data. They looked into incidents involving any kind of

fire on the vessel. An investigation was conducted to determine if the episodes were caused by a human error, a thermal reaction, a mechanical failure, or an electrical defect. The principal causes were listed under "thermal reaction," negligence, incorrect storage, and breaches of the relevant codes. The author propose these preventive or control actions: "adequate training for the storage and handling of Hazardous and Toxic Substances (HNS) commodities, proper hazard and safety evaluations, and sufficient supervision." This appropriate supervision would probably focus on situations where there is a lack of comprehension or disdain for the standards. According to them, breaches of policies and guidelines are the primary cause of fires and explosions generated by thermal reactions (Baalisampang, 2018).

Inspecting cargo transport units that are moving general cargo is required to identify harmful items that have not been reported; nevertheless, less information is provided for this kind of examination. A particular experiment was detailed by Dupin (2019), in which 500 containers were examined at ports in the United States. Four major container shipping corporations chose these 500 containers. The checked containers included those being imported and exported, containers carrying hazardous goods, containers carrying regular cargo, and containers carrying other types of cargo. According to the investigation findings, there was at least one problem with 55% of the containers. Eight percent of imported containers included misdeclared goods, but only 5 percent of exported containers did. It was challenging to find specific grounds for noncompliance with limits placed on risky items by a review of the relevant literature.

Nevertheless, one of the reports offered believable explanations for the particular occurrence that was looked at. According to the Yantian Express accident investigation report, if the biochar (thought to have been the cause of the fire) had been correctly declared, it would have required a certificate stating that the substances would not cause a fire. These tests would have shown that the biochar had a limited ability to self-heat (BSU, 2020).

3.2.3 Others (Smuggling, Illegal immigration)

Illicit activities at sea, especially aboard ships, have long concerned policymakers regarding the increased danger of stowaways in containers and the theft of goods. This issue has been there for a considerable amount of time. The volume of container

flow makes it virtually impossible to control. The case of “Container Bob” had become well known for an al-Qa’eda operative who was found in a container in Italy attempting to travel to another country (Wikipedia, 2022). Or the case of immigrants screaming for help inside a container in the UK (Barrett, 2014).

The majority of the cocaine that is available on European drug markets is thought to have been smuggled into the continent by water, specifically in containers entering essential ports such as Antwerp, Rotterdam, and Hamburg, as indicated by seizure data from the United Nations Office on Drugs and Crime (UNODC). The UNODC said in its report for 2021 that because of COVID-19 measures, there would likely be an increase in the amount of natural cocaine transported to Europe that occurs by sea (UNODC, 2021).

According to the UNODC report, in 2018, most heroin and morphine were seized in Belgium, Western, and Central Europe. This was followed by France, Italy, the United Kingdom, and the Netherlands. Even though heroin and morphine are smuggled into Central Europe through land routes, most drug trafficking to Belgium in 2018 was conducted via sea transport (UNODC, 2021). The UNODC warns that the flow of drugs surged across the water during the pandemic, notably due to the significant decrease in air travel and the shutting of borders within the EU. There is a possibility that packages of narcotics are hidden among the cargo or inside the structure of the container itself, either in the walls or under the floor. It is possible to hide some goods inside the refrigeration units of reefer containers with these units. To disguise the whereabouts of the parcels, it has been alleged that drug traffickers posed as port officials and stevedores to designate containers as examined using counterfeit official seals. After a container has been sealed and brought to the loading area, the crew will not be allowed to explore the contents.

Most seizures and suspect shipments of military hardware, dual-use items, and missile technology also occur via sea transport. It is also the primary method for transporting sizable loads of bulky conventional weapons and military hardware to impoverished nations. According to studies, the direct way of smuggling small arms and light weapons to non-state actors in Sri Lanka, Somalia, and Colombia has been by sea (Cragin & Hoffman, 2003). Over 2500 reported cases of maritime trafficking in illegal goods, including counterfeit goods, smuggled consumer goods, and oil. There

have also been reports of transfers by the sea of weapons and dual-use items that could destabilize the region. Other illegal activities include illegal, unreported, and unregulated (IUU) fishing and the movement of undocumented migrants in boats that could endanger the lives of their passengers (Griffiths & Jenks, 2012).

Dangerous gases are a widespread issue in shipping containers. According to research, gas concentrations in about 20% of shipping containers are above the acceptable limits for occupational hygiene. A New Zealand Customs Service report from 2013 found that, out of 500 containers, nearly 90% of the interior air was contaminated by fumigants or other gases (Peters, 2017). Numerous containers are fumigated to protect the cargo and stop the spread of pests worldwide. This means that hazardous substances are placed inside the container, and even though the container ought to be ventilated afterward, sometimes the implications are still present. Even at low concentrations, the chemicals used in fumigation are frequently highly toxic and can seriously endanger human health. Off-gassing from goods or their packaging constitutes the second source. The concentrations can increase to dangerous levels in a small area. At least three of the 270 containers lost by the Panamanian-flagged MSC Zoe during a storm in 2019 are believed to contain hazardous chemicals, and a 25-kilogram (55-pound) bag of highly flammable organic peroxide powder has already been found on the island of Schiermonnikoog off the coast of the Netherlands (Knight, 2019).

The death of 39 persons in a refrigerated container in the United Kingdom has shocked the globe (Waters, 2019a). However, catastrophes associated with illegal immigration have occurred, continue to happen, and will continue to occur. In actuality, the case of 39 deaths in containers in the United Kingdom is not uncommon in the context of a wave of illegal immigration into the United Kingdom, the United States, and Europe - the "promised lands." Still, the warning bells are not enough of a wake-up call for that desiring migration for various reasons. The voyage is arduous and frightening, but the risk is frequently worthwhile. A life-altering opportunity is worth the danger, particularly when victims are persuaded that they have a strong chance of surviving and gaining money, not to mention that human trafficking excursions are typically successful.

It is commonly believed that migrants are the poorest members of society, those seeking unskilled labor, or those fleeing terrorism. However, this is not always the case. Migrants to Europe or the United States are often not the "poorest of the poor" since they must have adequate financial resources to move legally or illegally. If you follow standard procedures, you will require a passport and visa fee. When using illicit routes, traffickers frequently ask for hefty fees.

Moreover, to be aware of opportunities, one must have an international network of contacts. And frequently, family members have lost away by the same means. High-skilled and low-skilled individuals choose to reside in distinct locations, indicating that their migration routes vary. In addition, there exist disparities in migration prospects, which may prompt some individuals to turn to traffickers. Migration and human trafficking are frequently intertwined. The migration of individuals from Syria, Iraq, and Afghanistan into Europe is commonly featured on the top pages of major publications. As land-based choices diminished, they went to the sea.

CHAPTER 4 RULES AND REGULATION

In this chapter, the author will describe the existing rules that affected the container's management and mitigated the related risks.

4.1 The SOLAS Provision

In May 2014, the Maritime Safety Committee (MSC) of the IMO accepted modifications to SOLAS Regulation VI/2 regarding ship cargo information (IMO, 2014b). SOLAS began in 1974. The MSC received this modification and supplement during its 94th session (November 2014), which will take effect on July 1, 2016 (IMO, 2014c). Before loading, the shipper must confirm and submit the container's gross weight to the master or a representative of the master and a port facility representative. The MSC Napoli split the UK's south coast in half on January 18, 2007 (MAIB, 2008). Multiple containers were on deck, according to the investigative report. This raises the ship's overall weight above the cargo bill, threatening its stability. Since the MSC Napoli sank, IMO requires weight verification before loading all containers. The 94th IMO MSC session accepted this required regulation.

4.2 IMDG Code

The International Maritime Dangerous Goods (IMDG) Code pertains to the shipment of dangerous packaged goods transported by sea. The code was initially formulated in 1965 by the IMO as a document that was only intended to be advisory; however, in 2004, the general assembly of the IMO voted to make it obligatory, and it was subsequently incorporated into the IMO's SOLAS and MARPOL treaties. The code establishes guidelines for packing, consignment, and transportation. These guidelines include packaging, marking, labeling, placarding, stowing, segregation, and transport documentation (IMO, 2022f). The code is updated at regular intervals of two years.

4.3 The HNS Convention

The Torrey Canyon oil leak in 1967 was a good illustration of maritime tort law's inability to compensate for oil pollution damages caused by ships. This case prompted the international community to recognize the necessity for a convention capable of paying for harm caused by the transportation of oil and hazardous chemicals by sea (Zhou, 2020). As a direct result, the CLC in 1969 and the FUND in 1971 were established. These two agreements and their respective protocols, combined with BUNKER 2001, provide a legal framework that is adequately thorough in determining civil culpability and the amount of recompense for oil pollution damage caused by ships (IMO, 2022d). The HNS Convention is comprised of a total of two annexes, six chapters, and fifty-four individual articles. The purpose of the Convention is to ensure that compensation for persons, property, and the environment may be received quickly, efficiently, and reasonably in case an accident involving a ship that carries HNS occurs (IMO, 2022e).

4.4 Inspection of containers

In 1967, IMO started looking into whether or not shipping goods in containers was safe. It turned out that the container itself was the most crucial factor to consider. At a conference co-hosted by the United Nations and the International Maritime Organization in 1972, the convention developed by the IMO in collaboration with the Economic Commission for Europe was finally approved (IMO, 2022b). The Safe Containers Convention of 1972 was created with two goals in mind:

- One of the goals is to establish widely accepted testing procedures and corresponding strength criteria to ensure a high level of human life safety during the shipping and handling of containers.
- The second goal is to facilitate the movement of containers across international borders by applying uniform international safety rules to all forms of surface transportation. This inhibits the development of a variety of national safety regulations.

The Convention's requirements apply to the overwhelming majority of freight containers used for international shipping, except for containers designed expressly for use in air travel. The scope of the Convention is restricted to containers that meet

a particular minimum size requirement and include corner fittings that allow for handling, fastening, or stacking (IMO, 2022b). This is because the Convention did not intend to affect all containers or reusable packing boxes. In addition, IMO (IMO, 2022a) has released a lot of guidelines (both mandatory and non-mandatory) for container operation and inspection, such as:

- 1974 SOLAS Convention (chapters VI and VII and other relevant parts).
- MARPOL (Annexes III and V).
- Code of Safe Practice for Cargo Stowage and Securing (CSS Code) (IMO, 1991).
- Recommendations on the Safe Transport of Dangerous Cargoes and related Activities in Port Areas (IMO, 2007).
- Guidelines for the Preparation of the Cargo Securing Manual (IMO, 2014d).
- Inspection Programs for Cargo Transport Units Carrying Dangerous Goods (IMO, 2012).
- IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units (IMO, 2014a).

A container inspection is a process used to evaluate the structural integrity of intermodal containers in compliance with the rules that ISO and CSC set out. It is crucial to guarantee the durability of shipping containers before transporting goods from one means of transportation to another, whether by truck, rail, or ship. Regular inspections, such as using inspection checklists for containers, may help prevent damages that can lead to more severe issues and disasters. This is because damage can lead to a domino effect, where one problem can lead to another. Discussing the necessity of container inspection, Peregrine Storrs-Fox, the TT CLUB insurer's director of risk management, gave out his thought:

> “With the string of containership fire casualties and fatal incidents at storage facilities, most recently at Chittagong, in our minds, our current concerns are manifest. They constantly remind us of the importance of adequate safety procedures in packing, handling, and transporting the array of cargoes that can potentially cause catastrophic incidents” (Baker, 2022d).

Around 72,408 containers were inspected in 2019, according to the Subcommittee on Carriage of Cargoes and Containers (CCC) sixth report. Defects were discovered in

5653 containers, which equates to 16.44 percent of the CTUs examined (IMO, 2019a). Placarding and marking accounted for 57.12% of all deficiencies, followed by securing/stowage inside the unit (16%), marking and documentation (9%), and other types of defects (15.12 percent). Low levels of container inspection and accident reporting constitute a significant problem worldwide. Only ten countries have provided results to the Sub-Committee for the CTU inspection programs established by the IMO in 2019 and 2020 (IMO, 2021). As a result, despite numerous initiatives to control and monitor containers, the work still depends on the country's willingness to reduce container risks.

CHAPTER 5 CONTAINER FLOW IN VIETNAM

In this chapter, the author will illustrate the current status of Vietnam and the problems that come along.

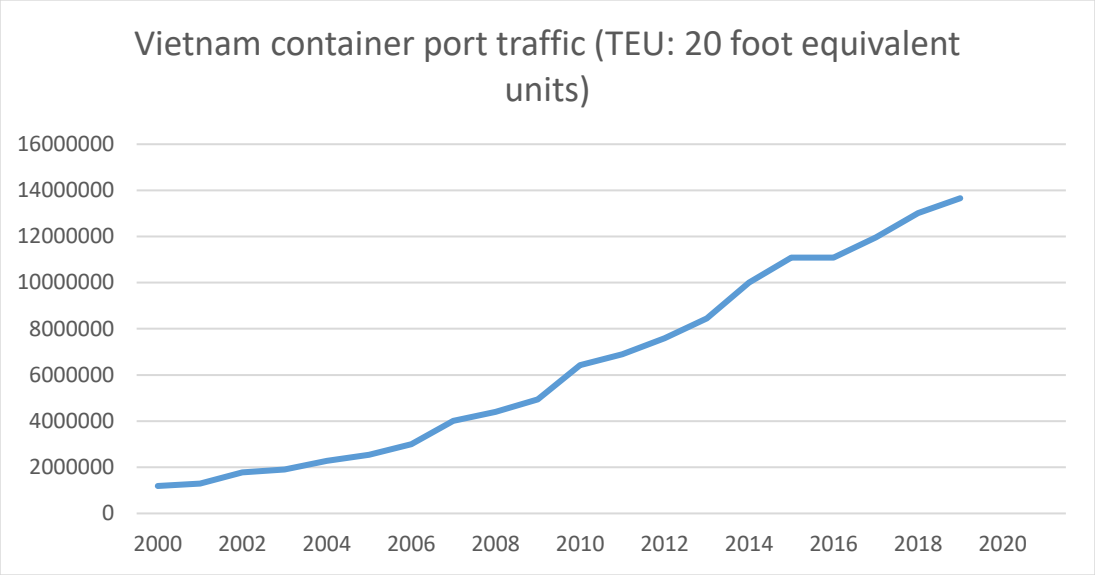
5.1 The current situation

Container shipping has been around for two decades and has spread widely worldwide. With significant advantages over sea freight in terms of transportation cost, transit time, level of transportation, and goods safety, container transport is on the rise worldwide. More than 80% of global trade is transported by sea (UNCTAD, 2021). Given that Vietnam is a nation with a long coastline that is located near some of the most important maritime routes in the world, marine transportation plays a vital part in the logistics service chain. In recent years, there has been a consistent and significant increase in the number of commodities passing through Vietnam's seaports, with an annualized growth rate of 13.8% (Vietnam Maritime Administration, 2021). Although the global community will be affected negatively by the COVID-19 pandemic, Vietnam will continue to increase the number of commodities that pass through its seaports in 2020 as the trend is rising, just like Figure 4. The report by VINAMARINE states that the volume of goods that pass through the seaport system reaches 692 million tons, an increase of 4 percent compared to 2019.

Additionally, the report states that the volume of containers reached 22.14 million TEUs, which is an increase of 13 percent compared to 2019. The volume of goods that passed through the seaport in the first six months of 2021 reached more than 364 million tons, an increase of 7 percent compared to the same period in 2020. Additionally, the volume of goods containers reached nearly 13 million TEUs, an increase of 25 percent over the same period in 2020.

Figure 4

Vietnam container port traffic (2000 – 2019)



Note. From UNCTAD (http://unctad.org/en/Pages/statistics.aspx)

The industry's expansion was rare during the epidemic and economic depression triggered by the nation’s record fourth wave of COVID-19. Mass immunization programs worldwide sped recovery in important markets like the US and EU, while free trade agreements boosted the export economy. EVFTA has boosted Vietnamese exports. Shipping expenses have soared. According to FREIGHTOS, shipping expenses have grown 300-500% since 2021 (Freightos Data, 2022).

Most expansion is expected in deepwater seaports like Lach Huyen and Cai Mep – Thi Vai. Deepwater ports improve shipping businesses' operations and efficiency. The resurgence of domestic industries will undoubtedly propel the industry's expansion. Vietnam's port infrastructure has been enhanced in recent years. World Bank's Container Port Performance Index (CPPI) 2021 ranks two Vietnamese seaports in the top 100. Cai Mep International Terminal is rated 11th and Hai Phong Port 63rd (World Bank Group, 2021). The country's master plan to enhance its seaports in the next ten years comprises $14 billion in infrastructure renovations to modernize the sector and promote future socio-economic growth (Huynh, 2022). The proposal intends to link industrial clusters to seaports, increasing freight volume to 1,414 million tonnes

annually. Development priorities include Hai Phong, Ba Ria – Vung Tau, and the core economic zone.

5.2 Some existing problems

Since April 2021, most southern regions have been hit by COVID-19, notably Ho Chi Minh Metropolis, Vietnam's largest city with the most ports. Ho Chi Minh City and neighboring provinces have recently imposed stringent lockdowns, disrupting supply systems and closing factories. The discharge of imported containers from southern ports like Cat Lai was dramatically delayed, although the number of imported containers rose daily. Consequently, port congestion worsened. Long-staying containers may be released. This release seems complicated, with thousands of containers backlogged for years. If goods don't fulfill importation requirements, they're auctioned, disposed of, or re-exported. The re-export order burdens shipping lines since shippers either vanish or are unresponsive. Without consignees, shipping companies can't deliver goods. This poses dangers for the containers since the contents might contain dangerous or explosive chemicals over time.

Port overcapacity is another issue. With Cai Mep port's current growth pace, a dedicated barge dock is needed to accommodate cargo demand. This helps lessen the main port's load and improves HCMC and Cai Mep port logistics. By 2030, Cai Mep and Cat Lai ports (HCMC) will carry 20.8 million TEUs of containerized products each year, while the country will handle 50.9 million TEUs. According to three forecasts, Cai Mep and Cat Lai will hold between 28 and 43.8 million TEUs by 2040. The expected rise in shipping traffic might hamper the functioning of the Cai Mep port cluster.

Cai Mep - Thi Vai port system in Ba Ria - Vung Tau and HCMC port system is under transition, evident in vessel deployment and freight growth. This is particularly true for crucial East-West networks servicing the US and EU and Intra-Asia connections to and from China. By 2030, ships with a capacity of 24,000 TEUs are scheduled to sail on the East-West service route routinely. East-West service lines can only dock at Cai Mep port owing to inadequate waterways. The predicted doubling of container traffic by 2030 affects customs agencies' capacity to process twice the transactions per container.

Future container system challenges include developing a barge system to transfer containers between HCMC, interior ports, and Cai Mep port. The new system will have two parts, say experts. One is the barge fleet and how the service lines are structured, and the other is the development of a barge berth at Cai Mep to serve the container ports there. Each is a possible target, needing considerable investment in a rising market where current infrastructure or barge systems can't keep up.

CHAPTER 6 DATA ANALYSIS

In this chapter, the author will analyze the data collected from the interviews and identify the gaps and problems in the container flow: Shipper – Carrier – Port – Master – Ship.

The categories and topics developed through the coding process, and the coding system gradually and collaboratively evolved. Theoretical underpinnings were established early on, and the concepts that eventually linked the codes, categories, and themes were constructed. The final coding system was composed of the following (major) categories:

- Risks
- Reasons for accidents/incidents
- Rules and Policies – many gaps in implementation

6.1 Risks categories

Knowledge

When questioned about their knowledge and understanding of container-related dangers, all participants expressed their specific knowledge of this issue. Most of the participants mentioned that the drop of containers caused significant damage to people and property:

> "…falling of a container at sea, damage caused by sea waves, water infiltration into the container, breakage of the container during loading and unloading and road transportation…" (M_1)

> "The cargo containers on the deck need to be properly and sufficiently lashed before the ship leaves the port and must be checked regularly during the ship's voyage at sea. Otherwise, it will lead to the lashing devices loosening when

the ship shakes strongly, and the container may fall out of position and into the sea." (O_1)

"…when the ship is moving at sea that will make the containers fall." (L_1)

"Not observing the containers, lashing, lining when transporting, loading, unloading or preserving … When stacking high floors on ships or yards without proper lashing, the containers will fall." (P_2)

Some other dangers, such as DG cargo, instability, and many others, are also mentioned:

"… losing stability… container on fire… "(O_5)

"Risk of declaration … a lot of possible risks to the container." (L_2)

Respondents have reported other issues such as thief:

"…cargo being stolen from inside the container…" (P_3)

Source of risks

When asked about the origins of container-specific hazards (such as misdeclaration, undeclared DG, and overweight), most participants agree that the shipper (consignor) is in charge of the situation.

Examples:

"The problem of declaration is the shipper fault, but it is also the forwarder's mistake for not checking the information carefully." (L_1)

"Most of them come from customers – the one who declares the information." (L_2)

"The origin of container problems comes from forwarders, road and water carriers, and ports for handling containers." (M_1)

"The problem arising from the owners of the goods…" (M_2)

"The problems can be lack of mistakes, lack of professionalism in declaring, packing goods leading to risks arising from goods in the containers" (P_1)

"Yes, if, for example, the customer didn't declare the mean to the right or the correct cargo, we can get the problem regarding the storage… if they didn't

declare the, I mean the nature of the correct nature of the dangerous goods inside the container." (P_3)

"These problems mostly come from the human factor such as lack of expertise, experience or sometimes they do it on purpose." (O_2)

Origins of accidents/incidents

The participants had reported many accidents. Most of these accidents involve damage to the container and related property. Some accidents also have a severe impact on human life.

Examples:

"Yes. I had an unforgettable experience during the inspection of the container on the shore because the container was infiltrated with water, causing mold inside, causing toxic gas when opening the container, causing 02 workers to be shocked with toxic gas and suffocate." (M_1)

"Yes. During the process of lifting the container to shore, due to the overweight of the container and poor maintenance of the cable, the crane cable was broken, the container fell into the cargo hold, the basement floor was deformed and punctured, and one worker was crushed by the container and broke his leg." (M_2)

"I have witnessed the scene where the ship lost control and crashed directly into the wharf (at SSIT), the ship tilted due to the poor stability of the ship leading to the shipwreck incident (at TCHP), the incident of burning coals on the ship and the entered the rescue port (at TCIT). I have also participated in responding to coal container fires at TCIT, recovering containers that were dropped due to ship collisions with barges at TCIT, general cargo ship's engine compartment fire incidents, and cooperating in handling the shipwreck incident at TCHP port." (P_1)

"I have witnessed the case of goods in the container spontaneously igniting due to the packing process (wooden products), workers smoked and dropped cigarette butts inside the container, fortunately, the container had not yet been loaded onto the port ship (this container is expected to be stowed under the

ship's hold), so the port handled it promptly by opening the container door and taking the goods out to fight the fire. If you put it in the ship's hold and catch it on fire during navigation, the consequences will be unpredictable, and the rescue work will be challenging." (P_2)

"The container fell into the river when unloading at the port. The salvage of this container needs timely coordination between the port, the ship, and the maritime port authority; the tugboat supports quickly bringing this container ashore, avoiding obstructions and danger to waterway traffic." (O_3)

"Yes, I have. The container fell when the ship was loading at the port, causing the ship to tilt and overturn. Therefore, when loading containers onto the ship, be careful not to let the ship tilt to one side." (O_4)

However, participants who work in the logistics industry and do not regularly participate in reality have never witnessed container-related accidents.

6.2 Reasons for accidents/incidents

There are many reasons for various types of risks that the participants reported.

"There are many subjective and objective reasons leading to accidents and incidents such as failure to comply with the loading chart, lack of diligence, inaccurate container weight, subjectivity of ship officers, loading and unloading workers." (O_1)

"If the stability calculation is not good, the stowage is not according to the expected diagram; the declared container parameters are not realistic; the water tightness of the ship (ballast condition, hatch cover) is not good are often the causes of the problem. Consequences are tilting the ship, falling the container, capsizing the ship, sinking the ship." (O_5)

"The lashing and lining of packages in the container are not being done properly, sufficiently, and suitable for each type of goods. Especially the goods with a large volume, such as rolled steel, machinery, logs, etc., leading to the risk of goods being moved when the ship is traveling in severe weather (the ship shakes vertically and horizontally), causing damage to the containers.

> The cargo can even tear the container out, endangering crew members, ships, and other cargo containers.” (O_6)

Many participants talk about the uncertainty of the container’s weight (overweight, mis-weight, weight allocation) that can cause significant accidents such as falling and capsizing. For the container, the actual weight of the goods inside matters more than the one on the paper.

> “The reason for this is because the seller/user of the shipping service did not declare and provide insufficient information about the goods, resulting in the ship's goods not showing the correct information and the nature of the goods on the bill of lading. This particular action can reduce shipping and ancillary costs or avoid procedures for consignees when completing procedures at the import border gate.” (L_1)

> “In some cases, new customers lack information and experience declaring goods. In some other cases, the customer knows the item well but still deliberately declares it wrong, declares lack of information to make it easier for customs clearance and shipping to be accepted by the ship.” (L_2)

> “The misrepresentation of dangerous goods is due to legal and profit issues and is often intentional.” (M_1)

> “Declare missing dangerous goods information or fail to declare. Lack of dangerous goods labels according to IMO regulations. These two problems usually come from the forwarding practices of each area” (P_2)

> “Customers do not declare DG goods or declare incorrectly, leading to the loading, unloading, transportation, and preservation of DG goods not by IMDG code. In addition, the volume of DG packages in the container does not conform to the regulations in the IMDG code (usually larger than the specified level), leading to an increase in the level of risk and causing many difficulties in the handling of related incidents.” (O_3)

With the dangerous goods, all participants report the misdeclared information for a specific type of cargo. Not informing some dangerous loads can lead to improper lashing and preservation, resulting in fire and sometimes explosion.

> “Transport costs and transit time requirements greatly influence the level of monitoring of containers. Crew members will not have time to check thoroughly but can only rely on the declared information.” (M_1)

> “…high-cost increases transportation speed greatly reduces loading and unloading time, causing omissions in container monitoring.” (M_2)

> “Speed and Transport costs are often related to input fuel prices and operating and maintenance costs of transport. However, these two factors also affect the management and supervision of Containers.” (L_1)

> “Yes, influence a lot. The cost of dangerous goods will be much higher than normal goods. This creates a mentality for customers. They will try to hide information if they want simple and less expensive shipping. Transport speed is a crucial factor for normal and dangerous goods. Low transit time will avoid risks. For example, fire and explosion goods and hazardous goods under the sun for a long time will have certain effects. So, customers will want to go as fast as possible.” (L_2)

Speed and transport cost are the two factors reported to be the reason for container accidents. Monitoring containers can be rugged due to the pressure generated from these two elements. Lack of monitoring of container flow and stowage affects container transportation in port and sea.

6.3 Rules and Policies – many gaps in implementation

With the rules and policies in line with container operations, participants have reported loopholes that can be taken advantage of.

> “In Vietnam, there are many regulations, but there are also many holes that make the transportation and supervision of goods not accurate and safe. For example, a ship's hangar has penalties for false declarations and incomplete declarations of dangerous goods. Regulations are one thing like when it comes to checking the cargo information of the ship; it is only for coping, personal experience. Customers can use this vulnerability to use related terms or provide missing information to pass the test easily.” (L_2)

“Current regulations for risk management and mitigation are being applied, but the level/level of human management will determine/affect the results… the current dangerous goods transport management processes are rigorous, but there are still cases where the law can be circumvented and loopholes.” (M_1)

“Tight packing, dunnage for easy to book the shipping slot, although it will cause a great risk of an accident because the crane operator and crew do not notice it during the loading and unloading process.” (M_2)

“Currently, to minimize the risk of containers, it will be based on cargo information to classify and arrange in separate areas based on the characteristics and characteristics of goods.” (P_1)

“Most of the transport units are small and private companies, the driving force is short-term contract workers, which can lead to loss of goods … Due to the large volume, the customs scanning system cannot control every container … Containers may be damaged during transportation. If the port is not carefully checked, there is a risk of unsafe loading and unloading (especially refrigerated, oversized, dangerous containers) … It is difficult to accurately determine the size of the oversized container (width, height, length), especially the weight.” (P_2)

6.4 Conclusion

According to the findings of the qualitative study, the people interviewed have the impression that they have a profound understanding of the dangers posed by the containers. Based on the analysis of the qualitative interview data, we can draw several conclusions, including the following:

- The participants are aware of more than one risk category; however, there are some dangers that they will only discuss when specifically prompted to do so.
- Participants are allowed to contemplate the current state of affairs and the effects of the rules on the risks.
- The dangers are categorized according to specific contexts, the significance of which can be interpreted in various ways.

- Participants are encouraged to connect their respective occupations' risks and contexts.

In addition to validating the concepts of the risk, one of the most valuable results of the qualitative analysis is that it provides insight into the diversity and context-relatedness of benefits, as well as the fact that the majority of participants can see the dangers in connection with their life contexts. The statistical analysis did not consider this particular facet of the problem. The interviewees emphasize their interest in the topics at hand, and they interpret the dangers associated with the container in the context of their strategies to stay safe.

One more finding that emerged from the analysis of the interviews was the fact that the interviewees described bundles of hazards rather than single dangers in isolation. Although they can usually differentiate clearly, they tend to view specific hazards as interconnected components of the container, particularly when considering the situation from a more global viewpoint. In other words, the people interviewed tended to convey their thoughts about the issue not as a single, isolated risk but as a component of a broader problem that affected many stakeholders.

Additionally, the reporting of gaps in the norms and regulations aimed at assuring the safety of containers is something that should be taken into consideration. Even though these laws are executed based on the standards and guidelines provided by international organizations, the execution and application are still contingent on national and human sovereignty elements. The gaps revealed during the interviews are merely a tiny component of an operating system that is highly complicated and extensive.

Most of these vulnerabilities are caused by persons involved in the container chain of operations. These people are unaware of the risks associated with taking advantage of these vulnerabilities for financial gains.

Accidents of a severe nature will, at some point, take place, and the resulting damage will, in a brutal way, affect not just one but many of the parties concerned, both in terms of their property and their persons. In addition to the influence of human error, the economy’s rapid expansion contributed to the breakdown of container monitoring. The strain put on individuals involved in container operation is compounded by the

issues that have already been stated, such as the cost and the speed of transit. As a result of these pressures, several weaknesses will be taken advantage of.

In a nutshell, the qualitative analysis provides a glimpse into the personal experiences and points of view of various people on the dangers posed by containers. A conclusive response could be given to why, despite legislative restrictions, hazards such as the misdeclaration of dangerous commodities and their non-declaration continue to occur. There is a lack of willingness to develop robust monitoring capacity and systems with efficient penalty systems when breaching rules. It seems that facilitating container flow subjugates the need for safety in port and sea. In addition, the investigation successfully shed some light on the existing circumstance thanks to the method taken to the matter. Several variables have contributed to the creation of gaps that make it difficult to assure the safety of containers. Some of these elements include confusing and hazy legislation, many parties involved in container operation; human factors; and economic pressure.

CHAPTER 7 RECOMMENDATION

In this chapter, the author will give some recommendations for the current situation in Vietnam to prepare for future development.

7.1 Responsibility and report

The word "responsibility" is weighty and often carries a pejorative connotation (Mitton & Harris, 1954). On the other hand, looking at responsibility from a different perspective can be seen as constructive criticism aimed at growth and improvement (Colle et al., 2014). In the event of an accident or mistake along the container supply chain, assigning responsibility to a single participant is more likely to result in more severe repercussions. This is because of the increased likelihood that the accident or error occurred. Accountability should only be used to evaluate, repair, and improve services and operating methods to produce better overall results, quality assurance, as well as quality assurance.

Because the case of the information contained within the container is currently being investigated, the majority of the testimony will be based on the ongoing honesty of the shipper and the specialized naval control department. It is predicated on the human element, which entails a high risk and can quickly produce weakness that others can take advantage of. What is required is an expansion of the roles and responsibilities held by each participant in the container chain. It is not just the responsibility of the shipper or the courier if there is an accident, an incident, or an error in the delivery of the package; instead, it is the responsibility of all parties involved. Not only will this help the combination of the two sides, but it will also contribute to the overall quality of the service. In the CTU Code, explicit instruction has been issued on one side; however, the rules are still static, and it is not required to follow the state’s rules (UNECE, 2014).

In addition, it is of the utmost importance to investigate and report any accidents, incidents, or violations, no matter how minor. Concealment of errors shows cowardice and weakness (Adler, 2015). No matter how big or small, defects always indicate something is wrong with the operation; testing and reporting will help improve and correct those gaps. Vietnam is a country located in Asia and is currently undergoing economic development. People tend to cover up their errors and blunders for various reasons, the most common of which concerns their self-esteem and feelings of shame. Because of this, many people have developed poor habits, such as taking bribes or placing blame to avoid taking responsibility for their actions. This is another significant challenge facing the maritime industry worldwide in the modern era, and numerous organizations are looking into ways to address it. Even though it is doubtful that this would change in a short time, the evasion of responsibility can be reduced to some extent if the parties involved in the situation automatically implement and work together to improve the situation. To elucidate this matter, it is necessary to spread awareness, organize dialogue and cooperation between the parties, and propagate information. However, understanding and training may not be sufficient; more decisive enforcement action should be triggered, including financial penalties and other sanctions.

7.2 Shipper’s duty

Although the author suggests that the responsibility ought to be distributed fairly among the various parties involved, the shipper’s responsibility continues to play a significant part in laying the groundwork for a safe supply chain. The provision of correct initial information regarding the shipper was responsible for more than 90 percent of the container's continued security. In addition, accurate and easy-to-understand information makes it simpler for other parties to perform their duties when inspecting and transporting containers. Drewry, a container shipping analyst, had demanded to call out and blame the rouge shipper that threatened the safety of the supply chain, such as sharing information on the usual criminals (Waters, 2019).

A shipper can check the overall weight of a filled container by SOLAS requirements using one of two methods:

- Method 1: Weigh the entire container and contents at an accredited weighing station.

- Method 2: weigh the goods in the container separately, then add up the weight of the empty container (IMO, 2022a).

The shipper must provide the container's total weight to the vessel's master, a representative of the vessel's master, and a representative of the port facility before the container may be loaded onto the ship. The container will not be able to be loaded onto the vessel if the shipper is unable to provide the required information. However, it may not be enough to ascertain the weight of the containers. Additional verification with a penalty system should be established during port operation.

In Vietnam, the regulations on penalties for shippers who make false declarations or declare a lack of good information are still at a mild level and do not efficiently deter violations. This is because the regulations are intended to prevent such behavior. In addition, the majority of shippers are individuals who do not have a high level of professional background; the majority of cargo owners are shippers. As a result, most shippers do not comprehend the risks associated with providing false declarations and lacking information. However, they understand the material involved in producing the products and related risks and must be able to assess the weight.

Others engage in this behavior for financial gain, taking advantage of the existing vulnerabilities to sidestep the laborious and intricate safety testing procedures. One of the things that Vietnam can do to alleviate and eradicate this problem is to increase the severity of the penalties for making false declarations or incomplete declarations of container information. This is one of the things that Vietnam can do. Because the consequences of this action are likely to cause significant loss in terms of property and people, the sanction and the fine should be raised to a deterrent level rather than just an administrative penalty. This is because the consequences of this action can potentially cause significant loss in port and at sea.

In addition to increasing the severity of penalties, shippers, particularly in the area of container declaration, need to be respected and registered. This is especially important. These professionals must have the appropriate level of professional training to comprehend the procedures and the dangers that could result from carrying them out incorrectly.

After receiving training in the appropriate procedure, the shipper should be awarded a practicing certificate. This will make it abundantly clear that he possesses the relevant expertise for the position and improve the shipper's sense of responsibility if there is an issue.

The Ministry of Transport will be the lead agency to organize the course and issue the shipper certification certificate. Only shippers who possess this certificate will be allowed to declare container information for transportation purposes. If there is a mistake, the shipper's practice certificate will be suspended as an appropriate sanction to hit the shipper's responsibility in finishing their work. This proposal will also contribute to reducing the large number of shippers who do not have reasonable expertise in declaring information and will make it easier to check container information. Additionally, this proposal will make checking the info on containers easier.

Furthermore, Vietnam should implement an additional verification layer for the container weight declaration from multiple entities. Not only the custom and the port who are doing the verification but also the one who participates in the container flow, such as the operator and the truck transporter. With an additional verification layer plus the heavy fine penalty for the crime, the situation of intensional false declaration from the shipper will be mitigated effectively. The money collected from the penalty can be reused for investment in technology or human (raising salary) so that the mitigation framework can be enhanced stronger.

7.3 Weighting System

To contribute to the improvement of efficiency as well as increase authenticity and speed in the operation of the supply chain, technology should be applied in the container supply chain. This will allow for the supply chain to operate more smoothly. Using new technologies in the operation process is feasible and appropriate for the development of the country, particularly Vietnam, in the current era of 4.0 technology, which is currently underway.

The financial investment made in cutting-edge technology for the container-weighing process should be a major change for the system. A significant number of accidents were caused by containers whose weights were misrepresented, the vast majority of

which contained excessive cargo. In light of this, the issue of verifying the container's essential to determine the weight accurately needs to be focused on. Considering how hard it is to check the weight at the shipper's end, it makes more sense to check the weight at the port or terminal (Saroni, 2015). This is in addition to the declaration that the shipper makes. Investing in equipment that can measure the load of the container at every stage of its journey, from the warehouse to the truck and, finally, to the docks, is one way to improve this situation. Every container terminal should have a weighing and checking station for containers. This would confirm the actual weight of the container, which would, in turn, protect both the container and the shipping vessel. A solution like the dynamic truck scale weighing system proposed by Dong et al. (2015) can be considered to enhance the accuracy of weighing containers. Another solution to consider is the system of automatic weighting cranes. When the crane is lifting the container, the actual weight recorded data will be sent to the crane operator to double-check with the weight declared on the manifest for safety.

Investment in modern systems can be expensive, but with the rising container industry, the money is only a tiny amount. It will depend on the willingness of the port to enhance the safety of container operation.

7.4 Simplicity

The declaration and inspection of containers are still challenging processes in Vietnam at the moment. More specifically, the functions overlap between various stakeholders regarding the goods' sources within the container. Mr. Claudio Dordi, the Director of the Trade Facilitation Program, made the following observation about this matter: "The dilemma is to reduce the costs and time of inspection to promote trade; however, on the other side of the balance is to control the quality of imported goods" (Tram, 2022). The parties can exploit the system to gain economic benefits by taking advantage of loopholes that are created as a result of the overlapping of testing processes. The solution proposed for this issue is for Vietnam to consolidate the responsibility of container inspection into a single government department, specifically the customs service. Implementing this focal point will require a significant investment of time and resources. In addition, the practical unification of processes across agencies necessitates the existence of a physical infrastructure, which in this case takes the form of an electronic platform. In addition, coordination between

different agencies is essential to addressing issues and challenges that may arise during the transfer process. If, on the other hand, this solution is put into action methodically and sufficient resources are invested in it, monitoring containers and hazards will become more straightforward, more efficient, and more secure.

7.5 Training of supply chain workers

The human element is another component that requires attention to improve the efficiency of the regulatory and legal system. Increasing the awareness and knowledge of the container supply chain participants about the product's uniqueness and potential risks will serve as a protective layer to reduce the likelihood of accidents occurring.

Developing classes and courses on general knowledge and the hazards posed by containers is necessary. The group of people who work at the docks and the group of people who ship goods should both be prioritized as target audiences for these courses. If they receive proper training, they will better understand the risks posed by containers and the significance of protecting themselves and those in their immediate environment.

This will help reduce instances where workers are offered bribes to bypass safety protocols and replace hazardous containers. In addition, disseminating information will encourage reporting problematic containers, thereby establishing an additional layer of container inspection above and beyond the official inspection force.

CHAPTER 8 CONCLUSION

Even though the container has been instrumental in the growth of global economics and trade, the container itself has been fraught with peril, particularly for less developed nations like Vietnam that have restricted resources.

According to the findings of this study, the current situation of container flow needs to be improved to promote the shipping industry's sustainable development and increase the level of safety enjoyed by container operations in Vietnam. In addition, the study provided a summary and an analysis of the various perspectives held by stakeholders in Vietnam. As a result, appropriate recommendations have been proposed to assist in implementing the mitigation measures and ensuring the continued safety of container operations in Vietnam. It is anticipated that Vietnam will develop an international container fleet and become a hub for container trading in South-East Asia. This development will take place in the coming years. As a result, it is essential to prepare Vietnam for risk prevention measures in advance to satisfy the rising demand for container exchanges.

However, some aspects still have not been mentioned in the research, such as difficulties and obstacles such as congestion, reusing containers, inappropriate facilities, and the capacity to deal with significant container accidents. These are some examples. The author hopes that additional research will shed light on these facets, ultimately contributing to the increased safety of container operations and the environmentally responsible growth of the shipping industry in Vietnam.

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