CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF RESEARCH

In the early history of making vessel, human has allow the design of ship or large cargo to overcome the potential to be capsizing. Since then, the innovation of making vessel was develop for example flying Pros of the Landrone islands in 1519 among the scientific combination of weatherly qualities ever invented (Folkard, 1870). This is has to be done for allowing human to transport mineral with massive deadweight tonnage such as gold, lithium, iron ore, rutile, manganese ore, zircon, black coal, nickel, and bauxite. The amount of minerals to be export was greatly increase in these decades, it was recorded that iron ore imports by China surged to a record above 1 billion tonnes in 2016 (Bloomberg, 2017). This surely rose demand of large cargo to being operate for fulfil the need of market. There are many potential risks when cargoes like Bulk Jupiter, that carrying more than 46,400 tonnes of minerals across the pacific ocean in order to export to China. One of the risk in cargo is liquefy of minerals that may severe the motion of rock due to waves until the ship lose its centre of gravity that eventually lead to capsizing. The MS Bulk Jupiter is important case for studying risk on exporting minerals. It was depart from Kuantan, Malaysia on 30 December 2014 and sank off the coast of Vung Tau, Vietnam on 2 January 2015 with 16 loss; two dead and 1 survived (The New York Times, 2015).

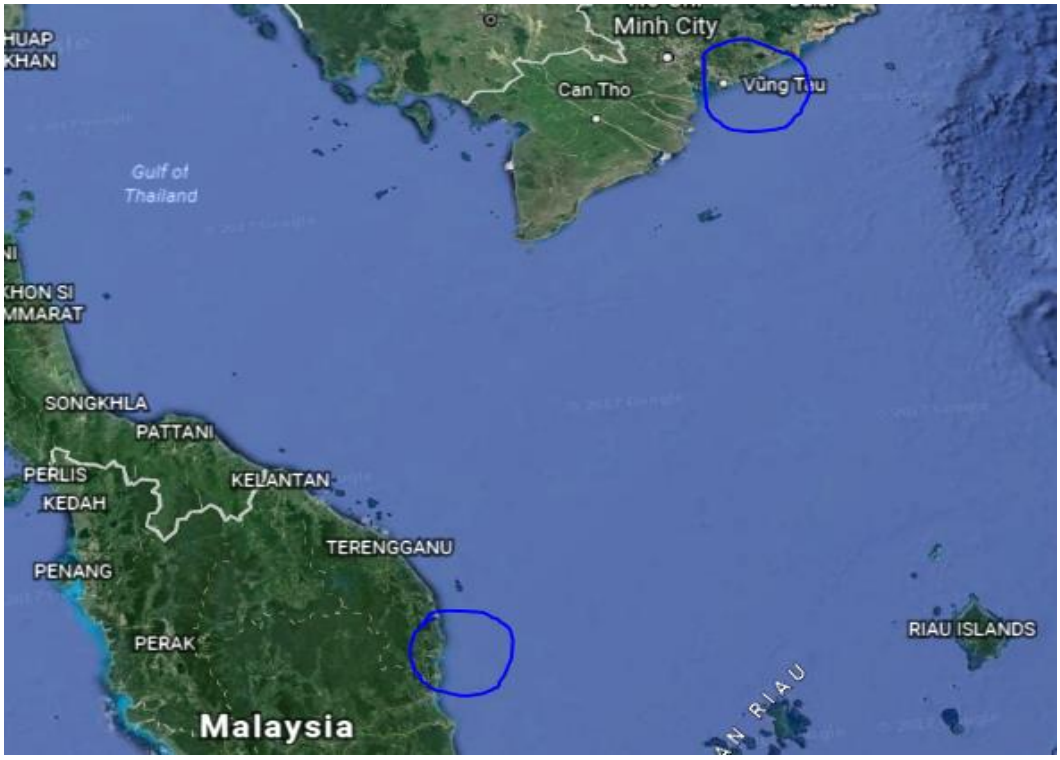

Figure 1.1: Map of highlighted Gebeng, Kuantan and Vung Tau, Vietnam

Source: Google Earth, 2016

The investigation and corrective action was stated clearly by International Maritime Organization, the Amendments to the IMSBC Code and Supplements (Carriage et al., 2015). For a number of years IMO has regulated the transportation of solid bulk cargo through the International Maritime Solid Bulk Cargoes (IMSBC) Code. Awareness of the properties of materials, and potential risks is continually developing. This is particularly true in regard the risk of liquefaction. Thus, IMO has approved a circular to warn ship's masters about the liquefaction hazards of bauxite, not to accept bauxite for carriage unless the moisture limit for the specific cargo is certified as less than the indicative moisture limit of 10% and the particle size distribution as is detailed in the individual schedule for bauxite in the IMSBC Code. In addition, the cargo must declared as Group A (cargoes that may liquefy) and the shipper declares the transportable moisture limit (TML) and moisture content. Australian and Brazilian shippers of bauxite have embarked on research programmes to investigate the behaviour of the minerals on 2015. The work specifically aims to understand any instabilities arising in the cargo due to its moisture content and the cyclic motion of the vessel, including the phenomenon of liquefaction.

The bauxite investigation follows that of the iron ore fines programme and represents significant investment by shipper to elucidate the real behaviour of bauxites cargoes and to ensure the continued safe shipping of the material. However, there is not yet available a single method to fully ascertain the behaviour of a bulk solid cargo undergoing transportation. The Association of Bulk Terminal Operators (ABTO) has thinking the same, calling for a complete overhaul of the cargo sampling and liquefaction testing protocols for raw ores and less common cargoes, such as nickel ore, fine wet coal and bauxite, pointing out that the current method for danger identification are inadequate, especially in ports where conditions are inclement. Professor Mike Bradley reminded that so called “splash” and “can” test – are very rudimentary (ABTO, 2017). Cognitively, this gap causing a lot of incident of cargo carrying minerals ore over the past years.

It is important to understand the soil texture or soil aggregation of bauxite in nature. The analysis of soil aggregation is important in a variety of application. It has some sort of explanation on bauxite liquefy in cargo. Aggregate analysis is often used in experiments where various tillage methods are applied and then evaluated by examining the resulting stable aggregates. Direct relation of aggregation to cohesive forces are important to understanding soil erosion and surface sealing. The stability of wet aggregates can be related to surface-seal development and field infiltration, as water stable fractions may restrict water entry and form surface seal. Aggregate analysis may help us understand most aspects of soil water behaviour, including runoff, infiltration (Loch, 1994). This perhaps explain the liquefaction in bauxite cargoes.

This research paper hope to relate all the available source of research, articles, comments from authority and experimental works on geotechnical and morphological perspective of bauxite. The information deduce in the end of this paper will gives the better view for other researcher to further insight on liquefaction of mineral in cargo during transportation. This surely will ensure the safe shipping of the bauxite.