Prospection and Analysis of New Maritime Trade Nets of Asia in the Malacca Strait

Final Project

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Abstract

The Strait of Malacca is a commercial step of great importance, where 60% of international maritime trade passes; it is crucial for global commerce but its geographic position makes it a dangerous chokepoint. In 2013 China unveiled its initiative of the One Belt, One Road. This project is in part aimed to consolidate the Chinese strategic position in Southeast Asia, promoting alternatives routes to secure the traffic of energy resources. The effects of the connectivity project have started to be relevant for the ASEAN economies as well as for the Malacca Strait itself. However, even when China is actively seeking to reduce its dependence on the Strait, the calculations carried on this study show the Malacca Strait as the best route compared to its feasible alternatives. Further studies of the economic benefits of other alternatives routes are considered as future works.

Keywords: *Malacca Strait, chokepoint, energy security, alternative routes.*

Resum

L'estret de Malacca és un pas comercial de gran importància, per on passa el 60% del comerç marítim internacional, però la seva posició geogràfica fa que sigui vulnerable. El 2013, la Xina va presentar la iniciativa de la nova Ruta de la Seda. Aquest projecte pretén, en part, consolidar la posició estratègica xinesa al sud-est asiàtic promovent rutes alternatives per garantir el trànsit dels recursos energètics. Els efectes d'aquest projecte destinant a millorar la connectivitat han començat a ser patents tant per a les economies de l'ASEAN com per a l'estret de Malacca. No obstant això, fins i tot quan la Xina busca activament reduir la seva dependència de l'estret, els càlculs realitzats en aquest estudi confirmen que l'estret de Malacca segueix essent la millor ruta en comparació amb les alternatives.

Paraules clau: *Estret de Malacca, punt crític, seguretat energètica, rutes alternatives.*

Table of contents

List of Figures

List of Tables

List of Abbreviations

AIIB	Asian Infrastructure Investment Bank
ASEAN	Association of Southeast Asian Nations
CIPE	China-Indonesia Peninsula Economic Corridor
DWT	Deadweight tonnage
EIS36	Eyes-in-the-sky
GNP	Gross National Product
IEG	Intelligence Exchange Group
IOR	Indian Ocean Region
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
LSCI	Liner Shipping Connectivity Index
MIMA	Maritime Institute of Malaysia
MMA	Monitoring and Action Agency
MOU	Memorandum of Understanding
MSP	Malacca Strait Patrols
MSP-IS	Malacca Strait Patrols Information System
MSR	Maritime Silk Road
MSSP	Malacca Strait Sea Patrols
OBOR	One Belt, One Road
ODI	Outbound Foreign Direct Investment
ReCAAP	Regional Cooperation Agreement on Combating Piracy and Armed Robbery against Sips in Asia

SAR	Search and Rescue
SCS	South China Sea
SLOC	Sea Lanes of Communication
SOLAS	International Convention for Safety of Life at Sea
SREB	Silk Road Economic Belt
VHF	Very High Frequency
VLCC	Very Large Crude Carriers

INTRODUCTION

Maritime transport has been the backbone of global trade and the global economy holding an irreplaceable role in geography discovery, culture communication and economy development in history. Nowadays, over 90 percent of the world's trade is carried by sea. It is, by far, the most cost-effective way to move goods and raw materials around the world. Maritime industry is an important economic sector as it has a direct impact on the prosperity of a region providing a source of income and employment for many developing countries[1].

The Southeast Asian region has played an important role in the development of global maritime economy and, at the same time, the sea has also played a pivotal role in the Southeast Asia's economic and political development.

In the early days, the Southeast Asia region was already portrayed as a land of wealth, and became known for its precious goods: aromatic woods, resins and the finest and rarest of spices. Its strategic position, between China and India, favoured a growing relationship with these nations, boosting the maritime trade in the region. The Malacca Straits was then already a critical trade route linking the Indian Ocean to the South China Sea and Pacific Ocean.

The Strait of Malacca is a commercial step of great importance, where 60% of international maritime trade passes[2], and one of the main oil transportation routes: its geographical position is essential for the entire Indo-Pacific region. But geography, which makes the strait crucial for global commerce, is also what makes it dangerous: the high traffic in the waterway has resulted in numerous maritime accidents.

[1]Chew, E. P., Lee, L. H., & Tang, L. C., 2011.
[2]China Power Team, 2017.

In 2013 Chinese President Xi Jinping unveiled plans for two massive infrastructure networks connecting East Asia with Europe: the "One Belt, One Road" (OBOR)initiative, which comprises the Maritime Silk Road (MSR) and the Silk Road Economic Belt (SREB). The project is a system of roads, power grids, ports and other infrastructural projects destined to create a more connected trade and a commercial zone between the countries in East Asia, Southeast Asia and Africa. The 21 Century Maritime Silk Road is not the first maritime initiative that China has undertaken to consolidate its strategic position in the geopolitics of the Indian Ocean Region (IOR).The Chinese need to consolidate and strengthen their position in the IOR in order to decrease their dependency on the region and its littoral for supplying their energy needs.

This new maritime trade net passes through the Malacca Straits and it is going to have a huge impact on the region. Considering that the volume of trade and of vessels passing the chokepoint[3] is expected to grow, the safety of navigation will be endangered. The Chinese are naturally concerned with this vulnerability, since more than 80 % of its crude oil and almost 30 % of its natural gas imports come through the Malacca Straits[4]. In order to overcome this weakness, alternative routes have been discussed.

Objective

The main objective of this project is to examine the geopolitical and economic impact of new Southeast Asia trade maritime networks, especially the 21st Century Silk Road, in the Malacca Strait motivated by the interest in securing the traffic of energy resources.

Furthermore, this paper wants to highlight and justify why the OBOR Initiative is so crucial for the region assessing the other feasible alternatives available at this moment, trying to judge its adequacy as well as its capacity to be enough in the future in conjunction with the Malacca Strait.

[3]*Choke point or Chokepoint is a geographical feature on land or sea that has to be traversed by the armed forces to reach their target destination. The Straits act as chokepoint offering possible control of the communications on the sea lanes and they are prominent in the global economy and shipment of goods across the oceans.* (Misachi, J. (2019, 12 of April) *What Is the Significance of A Choke Point?* WordAtlas. Retrieved from: https://www.worldatlas.com/articles/what-is-the-significance-of-a-choke-point.html)

[4]Gopal, S., 2016.

State of Art

Coverage of the OBOR Initiative in papers and mass media has been steadily expanding. To date, aside from providing background information, literature has largely examined the opportunities and economic and political significance of China's plans[5]. However, many analysis are policy prescriptions or the facts exposed are clouded by the own opinions of the writers and the motivations behind the initiative rather than showing the facts without bias.

The next section shows the methodology followed to calculate the estimated cost of rerouting the traffic from the Strait of Malacca to the other two alternatives, the Strait of Sunda and the Strait of Lombok. The assessment of the real costs in the case scenario proposed is the same as the model established in literature by different authors such as Grifoll, M., de Osés, F. M., and Castells, M. (2018), Cullinane and Khanna (2000), Stopford (2008) or Gkonis and Psaraftis (2010).

Methodology

To address this subject objectively this project focuses on the Strait of Malacca and the impact of the OBOR Initiative on it. First a review of the available literature has been done to elaborate a theoretical mark in order to put the lector in situation. Despite considering the geopolitics, the foreign policy or the economic relationship between the states involved as important, this project also wanted to provide the lector with some indicative data supporting the arguments presented. To do it so, the project follows an analytical approach examining the traffic volume, the tendency of growth and other variables capable to give a more objective image of the effects of this project on the region.

[5]Blanchard, J. M. F., & Flint, C., 2017.

CHAPTER 1. Southeast Asia.

Southeast Asia is a region of 11 countries that reach from eastern India to China. Most of the countries were once colonies of Western empires that by the end of World War II were dissolved[6], emerging these new nations. Due to the growing power of China and India the neighbouring Southeast Asian countries were encouraged to get together and cooperate with each other for protection and safety[7].

In 1967, five of those countries (Indonesia, Malaysia, Philippines, Singapore and Thailand) came together to form the Association of Southeast Asian Nations (ASEAN). Brunei Darussalam then joined on 7 January 1984, Viet Nam on 28 July 1995, Lao PDR and Myanmar on 23 July 1997, and Cambodia on 30 April 1999, making up what is today the ten Member States of ASEAN[8].

1.1 Geographical Description

Southeast Asia is significant because of its geography as well as the size of its population. Geographically, it plays an important role in the geopolitical and geostrategic context of the world[9].

A look at the map of Southeast Asia shows why maritime transportation is of special importance to the economies of the region; every country in the region, with the exception of Laos, has direct contact with the sea. Many of their littoral nations do not have well-developed land transport infrastructure, and for numerous islands there is not such feasible alternative. As it is shown, the region is highly dependent on maritime trade which constitutes a primary resourceof

[6] *The Portuguese appearance in Melaka and the Spanish in the Philippines in the early sixteenth century was a consequence of European territorial, economic and religious ambitions in Southeast Asia* (Orillaneda, B. C.: 3).

[7] Wang, G., 2017: p. 19.

[8] ASEAN, 2019.

[9] Amri, A. A., 2016: p. 10.

national income across all States[10].Economic developments that have followed globalisation in Southeast Asia have been much more successful because they are based more on maritime than on continental trade. Nowadays, the transport of goods, as well as resources such as oil, is done mainly by ships.

1.2 Trade Routes and the Strategic Straits

Southeast Asia is home to important sea-lanes and straits, which are major arteries of world trade; a large volume of international long-haul traffic crosses this area. Geography ensures that almost all such trade transits through the main southern Straits of the Indonesian archipelago: the Straits of Malacca, Sunda and Lombok[11].

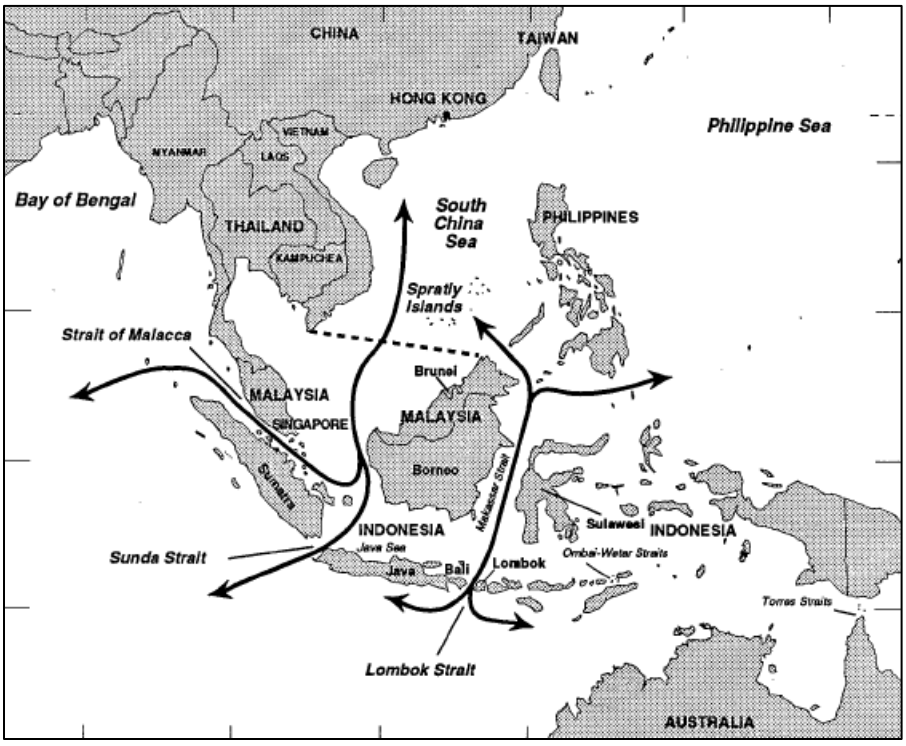

Figure1. Strategicchokepoints: Straits of Malacca, Sunda, andLombok[12].

In Asia, maritime industry occupies a central position, not only for economies with large transhipment ports like Singapore and Hong Kong, but much more for China and Japan who have an increasing demand for oil. About one-third of world trade passes through

[10]Amri, A. A., 2016:13; Noer, J. H., & Gregory, D.,1996: 1.
[11]Noer, J. H., & Gregory, D.,1996: p. 2-4.
[12]Noer, J. H., & Gregory, D.,1996: p. 3.

thesewaters.Morethan 50,000 vessels on international routes transit the Malacca Straits each year, which connects the Indian Ocean with the South China Sea. The Malacca Straits is also an important shipping route for productions from Chinese and Japan to European and African market. Furthermore, some of the world's busiest ports are also located in Southeast Asia or rely on maritime traffic through the region's waters[13].

1.3Economic dependency and strategic chokepoints

In maritime Southeast Asia, the South China Sea's (SCS) is a critical flashpoint where its position creates a security dilemma. Overlapping territorial claims in the region are closely linked to securing ownership of natural resources in the area. The Sea Lanes of Communication (SLOC) through the sea are important and have major implications for the economy of the regional trading states[14].

Country	% Share of World GDP	Trade Value through South China Sea (USD billions)	South China Sea Trade As % of All Trade in Goods
United States	24.5	208	5.72
China	14.8	1470	39.5
Japan	6.53	240	19.1
Germany	4.58	215	9.00
United Kingdom	3.46	124	11.8
France	3.26	83.5	7.77
India	2.99	189	30.6
Italy	2.45	70.5	8.14
Brazil	2.37	77.3	23.4
Canada	2.02	21.8	2.67

Table1. TheSignificance of SouthChinaSeaTrade in 2016[12].

[13]Yang, X. J., Low, J. M., & Tang, L. C., 2011.
[14]Wissmann, M., 2010.
[12] China Power Team, 2017.

Of all the volume transported by sea, 60% of it passes through Asia, with the South China Sea carrying an estimated one-third of it. The South China Sea is an essential maritime crossroad for trade; a disruption of trade in the region would precipitate a global economic crisis.

Among all the strategic routes that offer entry into the South China Sea, the Strait of Malacca is by far the most widely used. It is the shortest and therefore most economical passageway between the Pacific and Indian Oceans. The high concentration of commercial goods flowing through it has raised concerns about its vulnerability as a strategic chokepoint.

CHAPTER 2.Maritime Security in Southeast Asia.

2.1 Maritime Complexity in Southeast Asia

The maritime complexity of Southeast Asia could be attributed to several unique factors to the region. First of all, its strategic position makes Southeast Asia home to several international shipping lanes that straddle the territorial waters of numerous states[15]. In addition, there are several maritime areas shared by more than two states.

Besides, the differences between countries, such as language, culture or political structures, pose challenges which affect the communication and understanding among the states; some countries are democratic whereas Thailand still adopts the monarchy system and two of the states, namely Vietnam and Laos, are communist[16].

Southeast Asia is also significant because of its strategic straits, which are considered economic chokepoints to the world economy. Around 85% of Chinese oil imports and approximately 80% of the total import of Japanese petroleum are carried through the Malacca Strait[17]. Other states such as Taiwan and Korea are also dependant to the sea-lanes in Southeast Asia for raw materials carried from Africa and Australia through the Southeast Asian waterways to the industries present in East Asia.

[15]An example of this is The Strait of Malacca, which passes through the territorial seas of Malaysia and Indonesia.

[16]Amri, A. A., 2016: p. 49.

[17]China Power Team, 2017; EIA, U., 2018.

Furthermore, several ports located in this region are considered among the busiest of the world[18]and the presence of hub ports around the region increase heavily the traffic in the area.

Another complexity of the region is the presence of contested territorial and maritime boundaries which are often the source of friction and occasional violence between claimant States. In the South China Sea overlapping claims exist among China, Taiwan, Viet Nam, the Philippines, Malaysia, Brunei and Indonesia. In all cases, the disputes centre on who has sovereignty over the features in the region.

Figure2. Contestedwaters in theSouthChinaSea[19].

It has been stated that the region of Southeast Asia has enormous implications for global economic prosperity, politics and security. So, any serious conflict that were to disrupt the safe passage of trade and energy supplies, such as illegal activities involving ports, the hijacking of ships, as well as armed robberies, piracy and kidnappings, would have global consequences.

[18]*Through a series of advanced modernization and urban expansions, Singapore and Hong Kong had become two hub port cities, connecting Europe and North America with China and Southeast Asia* (Yang, X. J., Low, J. M., & Tang, L. C., 2011: p. 13).

[19]Gaynor, J. L., 2014: p. 47.

Due to their importance, Southeast Asian waterways not only concern the states in the region; there are other states that have a great interest in them. Consequently, it is common for non-Southeast Asian states to offer schemes of cooperation with Southeast Asian states and regional organizations. However, these actions are not always well received by the States in the region[20], and as a result, plenty of the initiatives end being rejected. This situation is mostly given when states are dealing with sensitive issues, such as maritime security, which could undermine their sovereignty. Because of the hesitation of some Southeast Asian states, cooperation with other nations is often complicated[21].

Other factors that prevent full cooperation include: fear that military cooperation may expose domestic inadequacies, increased importance of offshore economic resources, and overlapping claims of ownership of islands or sea areas which are located in strategic places or are believed to be resource rich. Additionally, rivalry between external countries such as the US and China or China and India have had an impact on the level of cooperation[22].

All these factors, the reluctance of allowing access to national waters from neighbouring countries as well as concerns over national sovereignty, have prevented a closer cooperation to date. On the other hand, in the coming years it will be imperative to increase the multilateral cooperation between all the nation in the Asia- Pacific region to guarantee maritime security, as the importance of the sea domain, stretching from the Gulf of Arabia and the Indian Ocean through archipelagic Southeast Asia and the South China Sea to the Western Pacific, resumes economic growth.

2.2 Strategic Interest and Cooperative Activities in Southeast Asia

The security environment in Southeast Asia is being shaped by global, Asia–Pacific-wide and domestic trends. Four major patterns of security cooperation combine and compete to

[20] *It is important to note that the principle of non-intervention (as mandated by the ASEAN Charter, not as a state policy) among the Southeast Asian nations could often pose serious impediments to regional cooperation. […] The principle of non-intervention has been firmly in place since the inception of the ASEAN regime in 1967, and was favoured by all member States* (Amri, A. A., 2016: p.14).

[21] All the members States of ASEAN, with the exception of Thailand, were once under colonial rules. So, for these States is extremely difficult to compromise their sovereignty by being involved in sensitive agreements. This hesitancy is an effort to avoid the perpetuation of colonialism in the region.

[22] Amri, A. A., 2016.

shape Southeast Asia's security environment: multilateral defence cooperation between external powers and individual Southeast Asian states; US–led theatre security cooperation; China leading East Asian regional security cooperation; and multilateral efforts centred on the Association of Southeast Asian Nations (ASEAN)[23].

A range of multilateral and bilateral agreements and other cooperative efforts to enhance maritime security have been implemented and discussed since 1992. ASEAN played a leading role in these efforts to increase cooperation in order to combat piracy, terrorism and other transnational crimes in the region. However, the exit has been limited by ASEAN's policy of non-interference in domestic affairs. Other multilateral agreements have also been implemented amidst difficulties. One example is the Regional Cooperation Agreement on Combating Piracy and Armed Robbery against Ships in Asia (ReCAAP), which promotes the sharing of information related to piracy and the establishment of an Information Sharing Centre[24]. Emerging security tensions have resulted in some increased cooperation among regional states and between regional states and external powers. At the same time, in particular cases these tensions have undermined confidence and trust among states and contributed to competitive rather than cooperative patterns of security cooperation[25].

Countries from outside Southeast Asia such as Japan, China, India, Australia and the USA have also expressed interested in playing a role in securing the region and have offered assistance to complement indigenous security efforts. As a result of the global financial crisis the power has shifted from North America and Europe to East Asia; this power shift has reinforced China's position[26] above the other nations.

[23]Thayer, C. A., 2010

[24]*However, the agreement does not oblige members to any specific action other than sharing information that they deem pertinent to imminent piracy attacks. Clearly, ReCAAP alone cannot combat maritime crime, including piracy in Southeast Asian waters* (Honna, J., 2013).

[25] An example of this kind of situation is China's military naval modernization that has created a security dilemma for regional states due to China's lack of transparency.

[26]*China now has an enhanced global and regional leadership role through the Group of Twenty and ASEAN Plus Three (APT)* (Thayer, C. A., 2010).

2.3 Overview of Maritime Security Challenges in Southeast Asia

Piracy, armed robbery at sea, maritime terrorism, smuggling networks and illegal, unreported and unregulated fishing[27] are maritime security challenges in Southeast Asia that need to be considered, and among them, piracy and maritime terrorism are the leading maritime security threats.

Southeast Asia has since the late 1980s also become one of the global `hot spots´ of pirate attacks[28] on commercial vessels and fishing boats. There were a total of 76 incidents of piracy and armed robbery reported in Asia between January to December 2018, comprising 62 actual incidents and 14 attempted incidents. Of the 76 incidents, four were incidents of piracy, while 72 were armed robbery against ships.

Figure 3.Piracy and armed robbery against ships in Asia[29].

Separatist groups and terrorists also pose a threat to vessels, ports and offshore energy installations in Southeast Asia. Volatile political environments in which separatists and terrorists

[27]*With the introduction of the concept of a 200 nautical mile Exclusive Economic Zone (EEZ) in 1982 and the increasing problem of over fishing in parts of the region, illegal fishing has become a security concern and has resulted in conflict between local and foreign fishers and the loss of revenue for affected local fishermen and their home countries* (Liss, C., 2007).

[28]*Criminal acts conducted in territorial seas where States enjoy both sovereignty and jurisdiction are not categorised as piracy. Indeed, such acts are considered by IMO to be armed robbery at sea. However, this distinction between 'piracy' and 'armed robbery' has led to other complications. As not every State has domestic legislation dealing with armed robbery, it is often difficult for governments to prosecute offenders who have engaged in such activities. Only those acts which are committed on the high seas (including the EEZ) where States enjoy freedom of navigation or 'mare liberum' are considered piracy* (Amri, A. A., 2016: p.59).

[29]ReCAAP, I. S. C., 2019.

operate can pose a threat to maritime security in two different ways. First, the disruption of the local economy by armed conflict can increase the crime rate and may result in a rising number of pirate attacks on vessels at sea or in ports and can also cause problems, in the form of local unrest, for companies in the energy or mining sector operating in the area. Second, separatists or terrorists can target maritime facilities directly.

> *There are numerous regional organisations which are particularly concerned about maritime security issues prevailing in the region. However, the complexities of the region as well as the inadequacy of these regional organisations to address the problem are the reasons why several maritime threats persist*[30].

[30]Amri, A. A., 2016.

CHAPTER 3.The Malacca Strait.

3.1 Geography and Maritime Trade

The Strait of Malacca is the longest strait in the world, stretching for about 800 km between the Malay Peninsula and the Indonesian island of Sumatra and has an area of about 65.000 square kilometers. The strait derived its name from the trading port of Melaka[31], on the Malay coast.

In the south of the strait, water depths rarely exceed 37 meters and are usually about 27 meters. Toward the northwest, the bottom gradually deepens until it reaches to about 200 meters as the strait merges with the Andaman Basin. Numerous islets, some fringed by reefs and sand ridges[32], hinder passage at the southern entrance to the strait.

Figure4. The Straits of Malacca region[33].

The Strait of Malacca is one of the most important shipping lanes in the world, connecting the Indian Ocean and the Pacific Ocean and linking major Asian economies. Each year over 60,000

[31]The Melaka state government on 2017 announced that the name "Malacca" for the state, commonly used in English, will cease to be used and instead be replaced with the name Melaka.

[32] The sand ridges are identified as accumulations of material that have been brought down by rivers from Sumatra.

[33]Gerke, S.; Evers, H.; Hornidge, A. K., 2008.

vessels[34] pass through the strait, carrying about one-fourth of the world's traded goods; about a quarter of all oil carried by sea passes through the Strait, mainly from Persian Gulf suppliers to Asian markets. In the narrowest point, near Singapore, the Strait is less than three kilometers wide; taking into account the traffic, it makes it one of the world's most congested shipping chokepoints.

Figure5. IndianOcean to PacificOceanmaritimechokepoints[35].

However, geopolitically, the Strait of Malacca falls under a number of different territorial and maritime jurisdictions. The International Hydrographic Organization[36] has defined the Strait of Malacca as the following:

• On the west: From the northernmost point of Sumatra (Pedropunt) and LemVoalan on the southern extremity of Phuket Island, Thailand;

• On the east: From TanjongPiai on the Malaysian Peninsula and Klein Karimoen, Indonesia;

• On the north: The southwestern coast of the Malay Peninsula;

• On the south: The northwestern coast of Sumatra to the eastward city of TanjungKedabu to Klein Karimoen, Indonesia.[37]

[34]See Annex 1. Statistics of the Malacca Strait.
[35] Hamilton, M.; Villar, L., 2017, August 11.
[36]It is a non-governmental body in charge of documenting hydrographic and maritime limitations.
[37]Zhong, Y., 2016.

3.2Tradedependency on the Malacca Strait

As it has been stated in earlier chapters, the Strait of Malacca is the shortest and therefore most economical passageway between the Pacific and Indian Oceans.

> *Oil shipments through the Strait of Malacca supply China and Indonesia, two of the world's fastest growing economies. The Strait of Malacca is the primary chokepoint in Asia, and in recent years, between 85% and 90% of annual total petroleum flows through this chokepoint were crude oil. The Strait of Malacca is also an important transit route for liquefied natural gas (LNG) from Persian Gulf and African suppliers, particularly Qatar, to East Asian countries with growing LNG demand. The biggest importers of LNG in the region are Japan and South Korea*[38].

There are some challenges that need to be addressed. On one hand, the danger of collisions, groundings, or oil spills due to the narrowness of some points of the strait. On the other hand, according to the International Maritime Bureau's Piracy Reporting Centre, piracy, including attempted theft and hijackings, is a threat to tankers in the Strait of Malacca.

It is important to highlight that if the Strait of Malacca was blocked, nearly half of the world's shipping fleet would be required to reroute around the Indonesian archipelago, such as through the Lombok Strait, between the Indonesian islands of Bali and Lombok, or through the Sunda Strait, between the Indonesian islands of Java and Sumatra. Rerouting would tie up global shipping capacity, add to shipping costs, and potentially affect energy prices[39].

Millionbarrels per day	2011	2012	2013	2014	2015	2016
Total oilflowsthrough Strait of Malacca	14.5	15.1	15.4	15.5	15.5	16.0
Crudeoil	12.8	13.2	13.3	13.3	13.9	14.6
Refinedproducts	1.7	1.9	2.1	2.2	1.6	1.4
LNG (Tcf per year)	2.8	3.5	3.9	4.1	3.6	3.2

Table2. Strait of Malacca Oilandliquefied natural gas (LNG) flowsbetween 2011 and 2016[40].

[38] Hamilton, M.; Villar, L., 2017, August 11.
[39] Hamilton, M.; Villar, L., 2017, August 11.
[40] U.S Energy Information Administration, 2017.

A wide variety of scenarios could disrupt shipping traffic and endanger commercial vessels passing through the Strait of Malacca. While a short-term peacetime disruption would force vessels to either wait until access is reestablished or consider using an alternate route, a long-term disruption could have far-reaching consequences for the millions of dollars of goods that transit the region each year.

The impact of a short-term peacetime SLOC closure for a specific economy would vary, but the global economy would not come to a standstill. Trade would likely continue to flow, despite increased costs. Although the financial burden of a short-term peacetime closure at the Strait of Malacca may be manageable, a host of secondary factors make it difficult to apply the offered estimates to long-term closure lasting several weeks or longer.

> *A long-term Strait of Malacca closure could also precipitate globally-reaching supply chain disruptions, especially among interregional trade routes and multinational production hubs that are geographically tied to the South China Sea. The countries of Southeast Asia would be particularly vulnerable*[41].

3.3Navigational Safety in the Straits.

It has been recognised that the best way to improve safety at sea is by developing international regulations and global standards related to SAR operations, load lines, carriage of dangerous goods, tonnage measurement and facilitation of International maritime traffic[42]. The latest is a key factor when ensuring the navigational safety in the Straits.

Statistics shows that 85030 vessels of all types[43] participated in STRAITREP and reported to KlangVTSin 2018. STRAITREP is a mandatory ship reporting system in the Straits of Malacca and Singapore that entered into force on December 1998. This system, provided for under the International Convention for Safety of Life at Sea (SOLAS), contributes to navigational safety, efficiency of navigation and the protection of the marine environment in the Straits by enhancing identification and communication between the different maritime agents.

[41]China Power, 2017.
[42]Wieslaw, T. 2012.
[43] See Annex 1. Statistics of the Malacca Straits.

According to the system, Sectors 1-5 and Sector 6 fall under the authority of Klang VTS and Johor VTS, respectively, while Sectors 7-9 are under the authority of Singapore Vessel Traffic Services (VTS) centre, also called the Singapore Straits.

SECTORS	VHF CHANNEL	VTS AUTHORITIES
Sector 1	VHF Channel 66	KLANG VTS
Sector 2	VHF Channel 88	KLANG VTS
Sector 3	VHF Channel 84	KLANG VTS
Sector 4	VHF Channel 61	KLANG VTS
Sector 5	VHF Channel 88	KLANG VTS
Sector 6	VHF Channel 88	JOHOR VTS
Sector 7	VHF Channel 73	SINGAPORE VTS
Sector 8	VHF Channel 14	SINGAPORE VTS
Sector 9	VHF Channel 10	SINGAPORE VTS

Table3. Jurisdiction of the STRAITREP system[44].

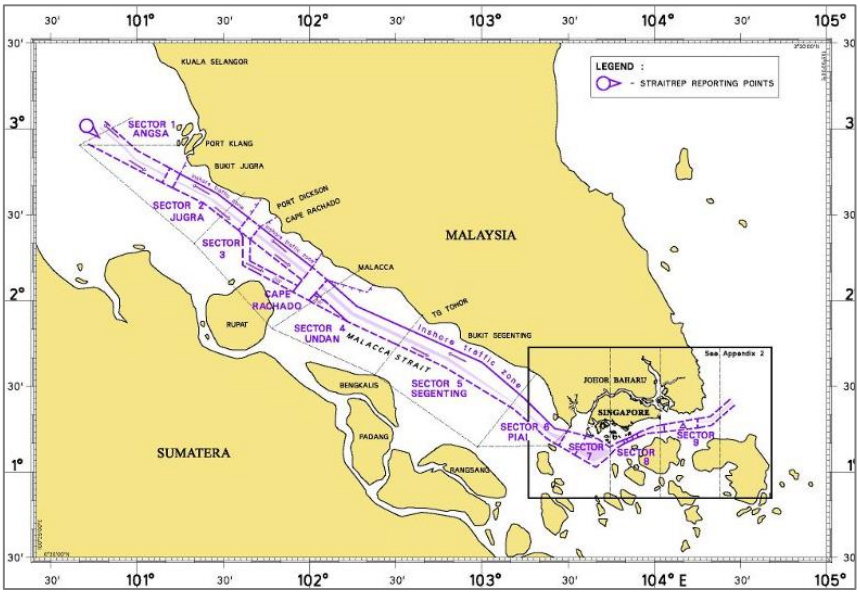

Figure6. STRAITREP operationalarea (sector 1 to 9)[45].

[44]Maritime and Port Authority of Singapore, 2017.
[45]Maritime and Port Authority of Singapore, 2017.

3.4The Malacca Strait in numbers: current situation and perspectives.

The data obtained with the STRAITREP is being used in this section to review the traffic on the Malacca Strait.

In the last four years, daily transit reports to Klang VTS increased from 222 vessels per day in 2015 to 233 vessels per day in 2018. This equates to nearly 10 vessels entering or leaving the straits every hour, or one vessel every six minutes.

Asia's role as an important port loading and unloading area is also in the region's high contribution to containerized port throughput. In 2017, ports in developing economies in Asia and Oceania handled 461 million TEUs, accounting for almost two thirds (61 per cent) of world port container traffic[46]. The trend towards very large and ultra large containership tonnage has dampened the overall growth in transits; the carrying capacity of newer ships have increased in recent times and as a result, container ports in the Straits handled higher cargo tonnage on fewer ships. Even though as it is displayed in the statistics of the Strait of Malacca (Figure 7), in 2018, container vessels accounted for 30,8% and remained the largest users of the straitdespite rapid growth in the size of containers on the trade with lines.

Overall tanker traffic, including VLCCs, saw 28127 transits in 2018, an increase of 787 compared to 27340 transits in 2017, showing a continuous growth. These tankers were carrying mostly clean oil products, and the yearly increase indicates the growing number of oil refineries in operation within East Asia, especially in China. Tankers alone accounted the second, with a 24,4% of the traffic.

[46]UNCTAD, 2018.

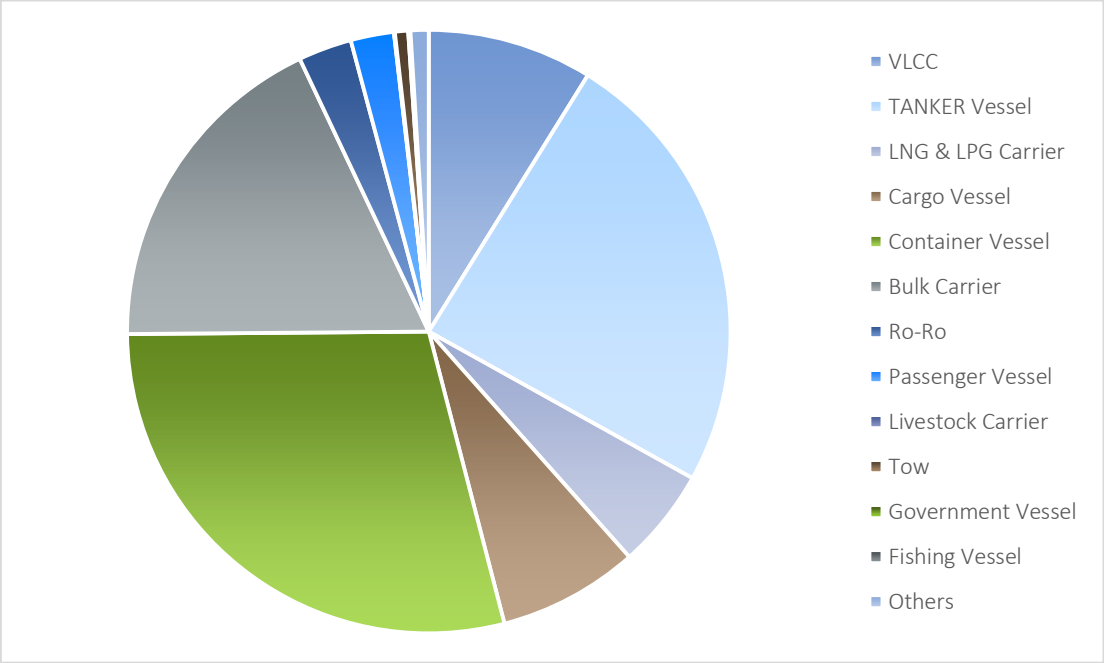

Figure7. Type of vesselreporting to Klang VTS in 2018[47].

Bulk Carrier traffic in the strait saw a steady growth too reflecting East Asia's import of raw materials such as iron, ore, and coal.

On the other hand, LNG and LPG vessel traffic saw a small increase in transits too, showing a slow but constant growth. Even when there is a higher demand of this type of vessel, that mainly transit the Strait when using the route from Middle East to East Asia, it is because sources of LNG and LPG cargoes are widely distributed around the world, and there are many routes that do not use the Malacca Strait, that it shows that small volume of traffic.

[47] Source: Own creation with data from Marine Department of Malaysia.

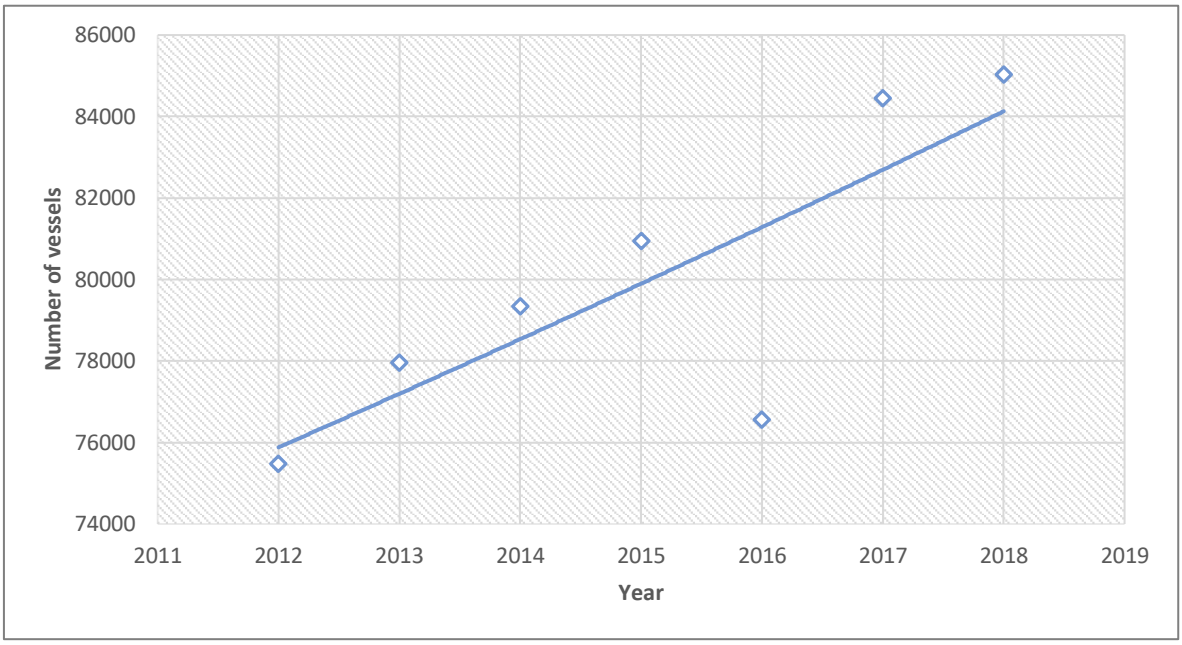

Figure8. Tendency of thetraffic in the Straits from 2011 to 2018[48].

The Figure 8 shows that the Malacca Strait follows a tendency of continued growth, hitting an all-time high of 85030 transits in 2018.

Due that continuous growth in shipping traffic increases the risk of collision in the Straits, the Maritime Institute of Malaysia (MIMA) conducted a study[49] to enhance the safety of navigation in the Strait of Malacca. The basis of that study was determining the Carrying capacity of the Straits to make an appraisal for Risk Governance.

In biology, the Carrying Capacity refers *to the number of individuals who can be supported in a given area within natural resource limits, and without degrading the natural social, cultural and economic environment for present and future generations*[50]. When talking of maritime traffic it could be said that the Carrying Capacity is the number of vessels that can be supported in a limited area, for instance a strait, without being a threat for that environment.

[48] Source: Own creation with data from Marine Department of Malaysia.
[49] HM Ibrahim; Mansoureh Sh., 2015.
[50] Rees, W. E., 1992.

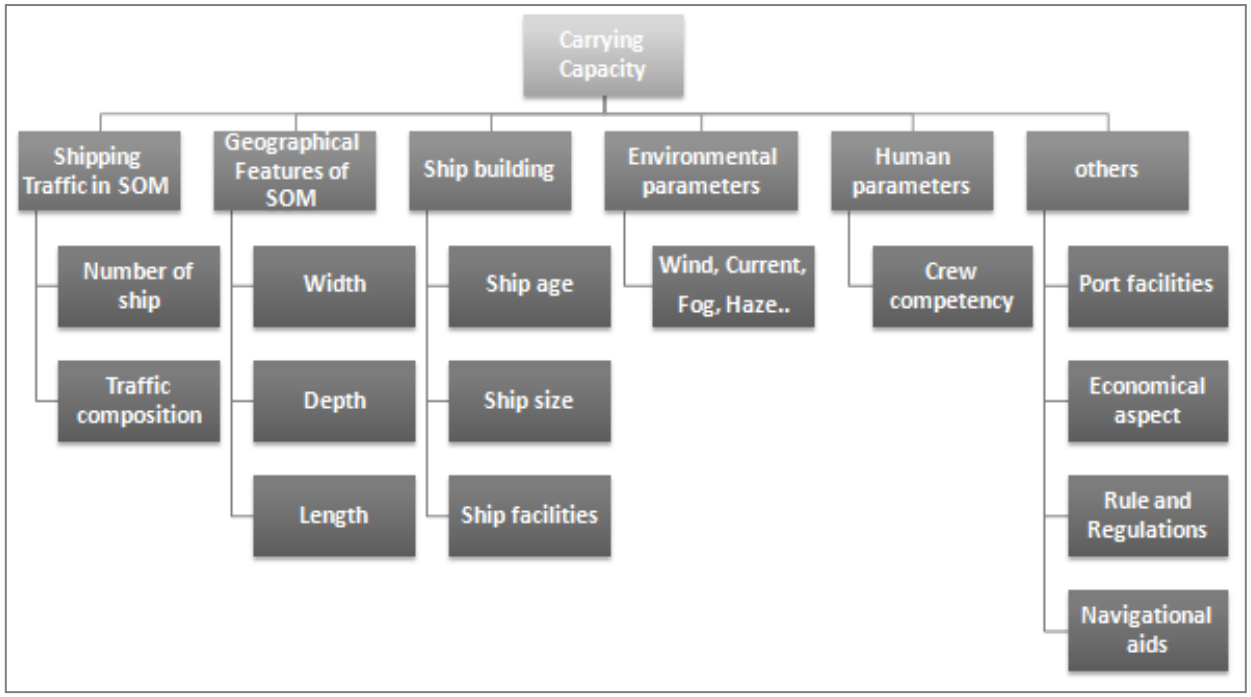

Figure9. CarryingCapacity Factors[51].

The Carrying Capacity can be calculated with the following formula:

$$Carrying\ Capacity = Maximum\ Arrival\ Rate \cdot 24 \cdot 365 \cdot 2^{52}$$

Being the Arrival Rate in function of the Level of Service and the Traffic Flow Rate:

$$Arrival\ Rate = f(Level\ of\ Service\ \&\ Traffic\ Flow\ Rate)$$

The data was analyzed as if it followed a queuing distribution. The number of vessels arriving within a fixed time interval was assumed to obey a binomial probability distribution. The service times were assumed to be identically distributed and statistically independent and, furthermore, it was assumed that vessels were handled in their order of arrival.

[51]HM Ibrahim; Mansoureh Sh., 2015.
[52]Considered as a round trip.

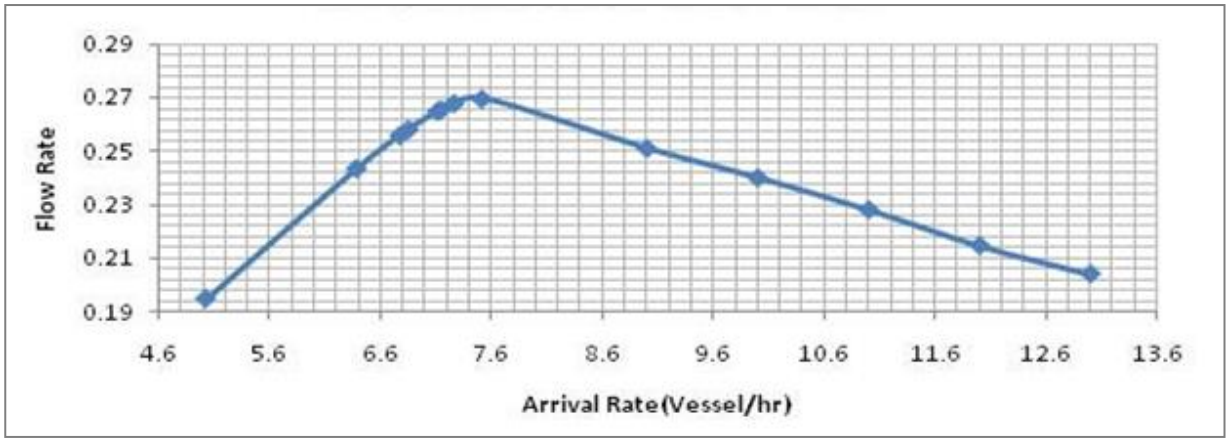

Figure10. FlowRate[53].

Being the Arrival Rate at Flow Rate 0,27 of 7 vessels per hour, the Carrying Capacity was calculated resulting in 122640 vessels per year.

$$Carrying\ Capacity = 7 \cdot 24 \cdot 365 \cdot 2 = 122640\ vessels/year$$

MIMA forecasted this number of vessels for 2024, as well the World Bank predicted a similar number in 2025, while the Japan International Transport Institute projected 140000 vessels in 2020. This results implicate that congestion will start when the number of ships reach the Carrying Capacity of 122640 annually.

However it must be considered that at the moment of the study, from 2000 to 2006, the growth rate of the Straits was about 6% per year[54]. Nowadays, the figures have changed drastically; the growth rate from 2017 to 2018 has descended to 0,68%. From 2012 to 2018 the average growth rate was of 2,67%; so, even when the tendency continuous being upwards, there has been a deceleration in the increase of the shipping traffic (Figure 11).

[53]HM Ibrahim; Mansoureh Sh., 2015.
[54]HM Ibrahim; Mansoureh Sh., 2015.

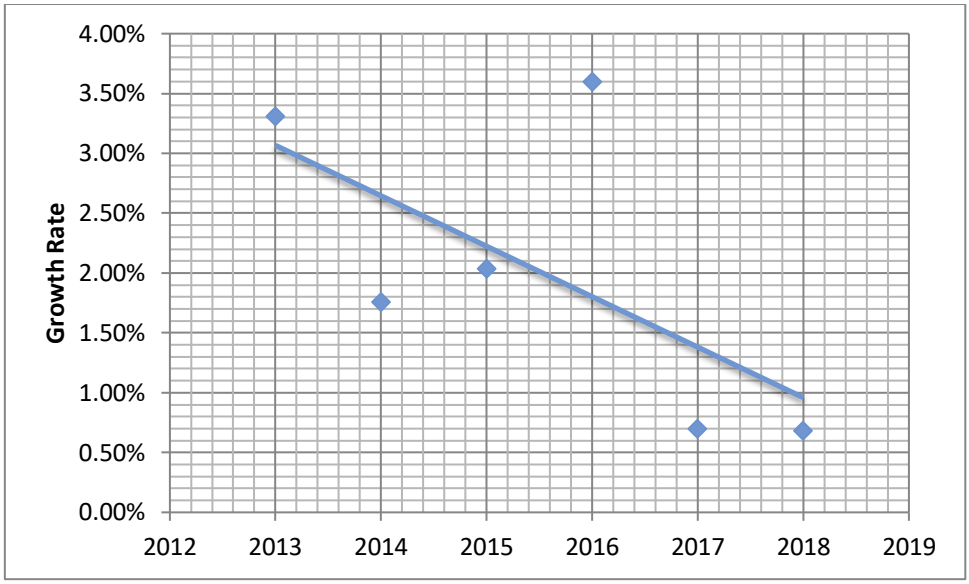

Figure11. GrowthRate of shippingtrafficfrom 2012 to 2018[55].

It could be considered that both, the declining growth rate and the decrease in the accidents in the Straits, are consequence of the measures taken by the authorities to ensure the safety of navigation. However, a double reading can be derived from the data when taking into account the impact of the Belt and Road Initiative.

While carrying capacity is relevant to natural condition of resource, environment, and communities present in the system, human beings can influence the carrying capacity of a system significantly. Usually, the Carrying Capacity in the Strait could be regarded as unalterable, if the environment was not going to change, however it can be altered introducing improvements in the system. Nowadays the conditions surrounding the Strait are different that those of the moment when the forecast was done.

As the Chinese President Xi Jinping said at the Opening Ceremony of the Second Belt and Road Forum for International Cooperation this past April, the joint pursuit of the Belt and Road Initiative (BRI) aims to enhance connectivity and practical cooperation, and it has put in place a general connectivity framework consisting of six corridors, six connectivity routes and multiple

[55]See Annex 1. Statistics of the Malacca Straits.*Table 2*.

countries and ports[56]. The improved interconnectivity has had an impact on the Malacca Strait, as it was intended, and that is being shown in the constant deceleration in the increase of shipping traffic. At this moment it is unlikely that the Malacca Strait is going to surpass its capacity in 2024.

3.5The Straits of Malacca fromthepoint of view of energysecurity

The disruption of energy supplies could have even more far-ranging economic consequences for the global marketplace. This is especially true for China – the world's top crude oil importer. In 2016, almost 80 percent of China's oil imports passed through the South China Sea via the Strait of Malacca. For a country like China, a long-term closure would present a worrying economic and political scenario.

The growth of the Chinese economy has been accompanied by a commensurate rise in a dependence upon offshore resources. Nowadays China is the world's largest consumer of energy. The United States is certainly dependent upon oil from zones of international tension. However, in the case of China, this dependence is far more pronounced. During 2017, China imported the highest dollar value worth of crude oil, with purchases valued at $162.2 billion or 18.6% of the global total of crude oil imports[57].

These sources of energy dependence create a dilemma for China. The vast majority of China's oil imports pass through the Straits of Malacca, Lombok and Sunda. This creates a security issue for China as the Straits function as a strategic chokepoint through which China's energy supply must pass. Essentially, whoever controls the Strait of Malacca has the ability to heavily disrupt a vital energy corridor to China. While this type of situation will hardly occur, the government of China is aware of its energy dependence and the vulnerability of this supply[58].

[56]H.E. Xi Jinping, 2019.

[57] Workman, D., 2019.

[58]*In 2003, Hu Jintao in a speech to senior party members at an economic work conference highlighted what he called the "Malacca Dilemma." According to President Hu, 80% China's trade passes through the 600-mile waterway including its oil imports. China is concerned about encroachments and free navigation through the strait. "Malacca Dilemma" has become the focus of Chinese planners as well as those outside watching China's rise* (Sarma, J., 2013).

It seems that the best method to solve the energy security problem is to deepen energy innovation, heighten energy use efficiency, attend to the international energy stock, and build up a steady international oil supply. These are the necessary conditions for safeguarding energy security according to researchers.

> *Cooperation among countries by means of conferences, built to enhance military defence and to protect countries' overseas interests, is also a necessary measure to ensure the nation's energy safety, in which multiply energy structures will be the ultimate solution to energy safety. Finally, multilateral security cooperation is necessary for the East Asian countries*[59].

3.6International Cooperation and Power Balance in the Straits of Malacca

The states bordering the Strait of Malacca, namely Indonesia, Thailand, Malaysia and Singapore form the core of the ASEAN region, one of the growth poles of the developing world. Diplomatic efforts to control the increasingly important passage between the Indian Ocean and the Pacific and the threat of piracy and terrorism started after the independence of the bordering states.

There have been attempts by the United States to assert military control over the Strait but they were met by stiff resistance from Indonesia and Malaysia[60]. Singapore took a more ambivalent role, offering naval facilities to the US fleet and leaning increasingly on American military support.

> *The response of the littoral states to piracy and threats of terrorism in the strait not only highlights their unease and distrust of each other but also demonstrates their desired balance of power for the region. Their preference is for each external power to be restrained by the involvement of the others. In the Malacca Strait this translates into a security strategy for the region which is enforced by the littoral states themselves and in which external powers play a supporting role. [...] Yet piracy and maritime terrorism are not the only threats that pique their concern over oil supply security and security in general – they are wary of the role that other countries could play in threatening their interests. Each external power is therefore not simply framing its response to piracy and terrorism in the strait based on those two issues alone, but also on the basis of longer term and more far-reaching interests*[61].

[59]Zhong, Y., 2016.

[60]*In March 2004, Washington proposed the Regional Maritime Security Initiative (RMSI), which was viewed as a complement to the US-led Proliferation Security Initiative (PSI) but Indonesia and Malaysia vetoed the presence of any foreign troops in their territorial waters* (Vavro, C., 2008).

[61]Vavro, C., 2008.

The littoral states want to be responsible for security within their own jurisdictions while the other states, especially the major powers, do not want to take any chance by leaving their vital interests to the littoral states' discretion.

Malaysia, Singapore and Indonesia launched, in July 2004, the Malacca Strait Patrols (MSP) to try to deal with the threat of piracy, and it can be considered one of the most successful examples of cooperation in the Malacca Strait. These patrols are made up of the Malacca Strait Sea Patrol (MSSP), the air patrols "Eyes-in-the-Sky" (EIS36) and the Intelligence Exchange Group (IEG), which operates through the information exchange platform Malacca Strait Patrols Information System (MSP-IS). Thailand also participates in these last three initiatives. Under the agreement, participating States have coordinated naval and air patrols, facilitating the exchange of information between ships and surveillance through Monitoring and Action Agency (MAA). Unfortunately, it is not a collective security framework.

CHAPTER4. New Trade Nets in Southeast Asia.

4.1The One Belt, One Road Initiative

Silk Road is the term widely used to describe the complex ancient trade routes linking East Asia with Central Asia, South Asia and the Mediterranean world that allowed during centuries the exchange of goods, ideas and people.

In the fall of 2013, during visits to Indonesia and Kazakhstan, the Chinese President Xi Jinping introduced for the first time the initiatives of the "Silk Road Economic Belt" and the "Maritime Silk Road of the 21st Century. On 28 March 2015 the project was formally presented under the document titled "Vision and Actions on Jointly Building Silk Road Economic Belt and 21st Century Maritime Silk Road" published by the Ministry of Foreign Affairs, the Ministry of Commerce and the National Development and Reform Commission. Since then, the One Belt One Road Initiative has become the centrepiece of the Chinese international strategy[62].

Figure 12.Geographic coverage of the Belt and Road Initiative[63].

[62]Du, M. M., 2016.
[63]Chin, H., & He, W., 2016.

The Silk Road Economic Belt will link together China, Central Asia, Russia and the Baltic; connecting China with the Mediterranean Sea and the Persian Gulf through Central Asia and West Asia; and connecting China with South Asia, Southeast Asia and the Indian Ocean. The project considers three routes:

- China—Central Asia—Russia—Europe (the Baltic)
- China—Central Asia—West Asia—Persian Gulf—Mediterranean Sea
- China—Southeast Asia—South Asia— Indian Ocean

On the other hand, the new Maritime Silk Road is going to connect the Chinese ports with emerging countries and economic regions such as the Pacific Islands, the Association of Southeast Asian Nations (ASEAN), the China-Indochina Peninsula Economic (CIPE) Corridor, the Indian Ocean region and Africa through two main routes:

- Coastal China—South China Sea—Indian Ocean—Europe
- Coastal China—South China Sea—South Pacific

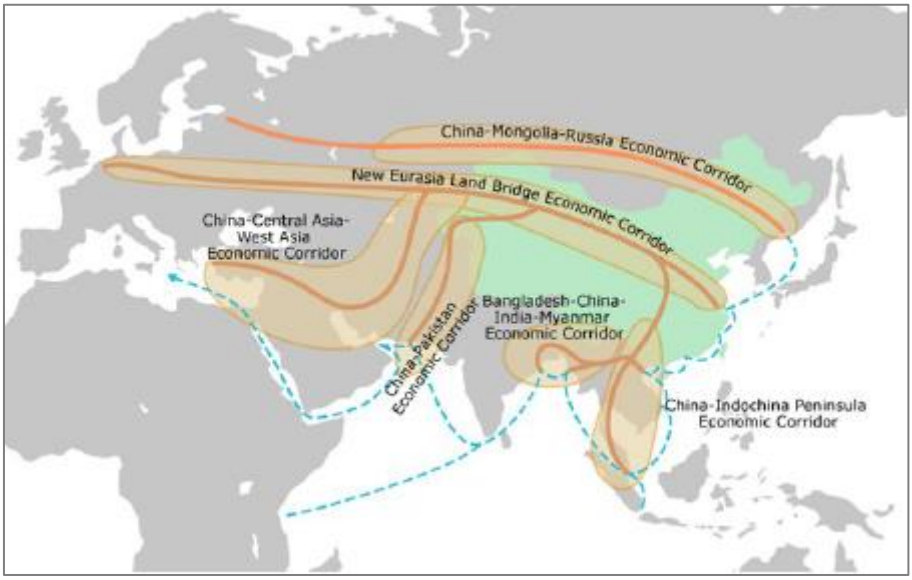

Figure13. TheCorridors of theBeltandRoadInitiative[64].

This ambitious project seeks to connect the continents of Africa, Europe and Asia, covering 65 countries that represent 55 % of world Gross National Product (GNP), 70 % of global population

[64]Liss, C., 2007.

and 75% of known energy reserves[65]. It intends to promote the cooperation in areas such as infrastructure, unimpeded trade, financial integration, investment and energy security.

4.2The Economics of the Belt and Road Initiative

The Belt and Road Initiative is, above all, a connectivity project that would involve the construction of new transport infrastructures, upgrading the connectivity between ports and inland waterways, the development of new logistic services and building free trade zones. As to achieve these goals demands a strong financial support, China has undertaken several institution-building activities at national and international level that could include investments approaching the $4 trillion, or even higher, reaching $8 trillion. It has been called the "Chinese version of the Marshall Plan"[66].

The Chinese government facilitated the establishment of the Asian Infrastructure Investment Bank and the Silk Road Fund, and reinforced the investment function of the China-Eurasia Economic Cooperation Fund.

In 2013, the Asian Infrastructure Investment Bank (AIIB) was proposed by China and the initiative was finally launched in October 2014, when representatives from 22 countries signed the Memorandum of Understanding (MOU).A total of 57 countries submitted their applications and become the founding members, of all of them, 37 founding members are from Asia and Oceania, and the rest are from Europe, Africa and Latin America. On 31 December 2015, all these 57 countries signed the Articles of Agreement that form the legal basis for the bank, marking the official establishment of the AIIB. The AIIB was open for business on 16 January 2016, with the headquarters in Beijing.

> *Although the AIIB must necessarily play by the global rules and despite the presence of Western countries and other regional powers within its membership (Russia and India), China's high voting share and its position in the centre of the stage allowed the Chinese government to employ the AIIB as a tool in order to promote its Belt and Road Initiative.*
> *China is the single largest stakeholder with a 26.6 percent of the voting rights and holds veto power in major AIIB decisions requiring a supermajority of 75 percent. Despite this position of power, some analysts think that with the admission of members the Chinese government would*

[65]Pop, I. I., 2016.
[66]Zhao, H., 2015.

> *be ready to accept a dilution of its voting rights. The high share of voting rights held by China allows it to employ the AIIB as a complementary tool to promote the Belt and Road Initiative*[67,68].

In December 2014, Beijing launched a bilateral initiative to improve trade links in countries along the Silk Road. The Fund, worth US$40 billion, targets infrastructure construction, exploration of natural resources, and industrial and financial cooperation.

4.3The Geopolitics of the OBOR Initiative

In order to carry out a process of regional cooperation, China has already established strategic partnership links with most of the great powers, emerging powers, medium powers and with some international organizations of regional integration (such as the EU or the Association of Southeast Asian Nations, ASEAN). For China, it is necessary to strengthen the scope of policies regarding economic cooperation in order to increase the relations of economic interdependence between China and its partners through the BRI projects.

The proposal of two "Silk Roads" shows the China's strategy of opening to the outside world. On the one hand, China's greatest edge in promoting the Maritime Silk Road lies not in China's advantages in military, economic, or geographical aspects, but in its close relationship with the countries and regions along the route. That's the reason why extraterritorial powers, such as Russia, the United States, Europe and Japan are tolerated rather than excluded, to emphasize the public spirit of international cooperation, making it not China's unilateral strategy[69].

> *Therefore, Trump's American withdrawal from the TTP and TTIP*[70] *after his election to office, and the American obsession in controlling the Middle East resulting in neglect of other regions, have both facilitated China's rise as political power, displacing the United States and the European Union as major sources of foreign aid to Africa and Latin America*[71].

The prevalence of the Belt and Road Initiative as the only existing major integration initiative with a global framework, have increased the willingness of the countries and regions along the

[67]Rodríguez, J. A., 2018.

[68]The 12 loans approved from June 2016 to May2017 by the AIIB involved seven countries; all of them part of BRI, and with 12 projects related to one of the six BRI corridors. This can be seen as prove that the bank is promoting Chinese geopolitical and commercial interest.

[69]Wang, J., 2015.

[70]Free trade agreements. Trans-Pacific Partnership (TTP) and Transatlantic Trade and Investment Partnership (TTIP).

[71]Rodríguez, J. A., 2018

line, that have strong desires to develop and to share China's development dividends. This has resulted in a dilution of the influence of the United States and Europe over the developing countries in the region.

In the last decade, China emerged as a key partner for the Southeast Asia region regarding investment, trade and infrastructure development. Southeast Asian economies have been benefited from the fast-economic growth of China[72] over the years. However, the resulting dependency on China has created a wide range of political and economic vulnerability for regional economies.

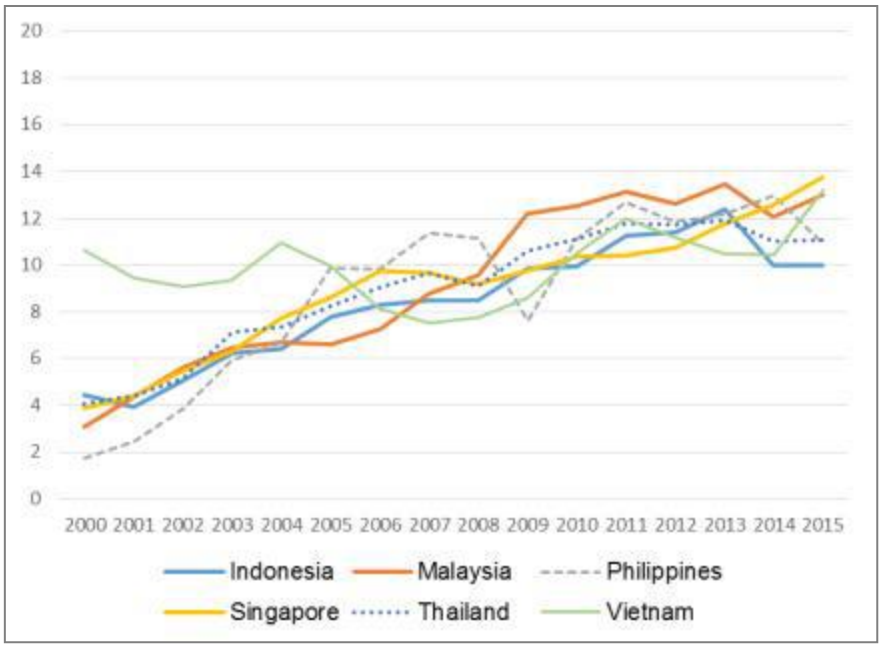

Figure14. Countries of ASEAN andtheirexportdependency on China (%) from 2000 to 2015[73].

On March 5 of 2018, the Centre for Global Development, based in Washington, published a report in which highlighted eight countries that could "suffer debt problems due to funding related to Belt and Road"[74]. All of them have reasons between debt and GDP dangerously high

[72] Since 1980, China has been the country with the highest economic growth in the world, with an annual increase of 10%. Despite the deceleration of the economy in recent years, it continues to be the largest of the great powers: in 2016, the GDP of the Chinese economy reached 11.1 billion dollars, representing an annual growth of 6, 7%.

[73] Oh, Y., 2017.

[74]The case of the port of Hambantota in Sri Lanka is often mentioned as a warning about an economy that goes into debt by signing loan agreements and losing the right to assets held by China. Though feasibility studies

and China as the main creditor. One of those eight countries is Laos, whose gross debt for 2018 was estimated by this institution at 70.3%, after registering 69% in 2017.

4.4The importance of the Malacca Dilemma in the Belt and Road Initiative

Nowadays up to 80 percent of energy imports travel through the Malacca strait[75]; its delicate situation, due to the increasing volume of traffic and other threats[76], makes raise its cost of use[77]. For instance, in 2005, the Malacca Strait was classified as a high-risk zone by Aegis Defence Services who led a risk assessment on it. The result was taken by Lloyd's Market Association's Joint War Committee that declared that the Malacca Strait was in jeopardy of 'war, strikes, terrorism, and related perils', adding it to the committee's list of high-risk areas. As a consequence, the insurance cost of vessels navigating through the Strait was doubled[78].

As stated earlier, China's appetite for secure energy imports is increasing in proportion to its economic growth. China's energy needs are expected to increase exponentially in the coming decades with forecasts predicting doubling of its consumption in the next three decades. According to the EIA[79] on its Outlook 2014, consumption of liquid fuels alone is predicted to double from the 10 MMbbl/day of 2010to about 20 MMbbl/day in 2040.

To enhance the security of its petroleum imports, China has taken a number of indirect actions; therefore, to avert the risks inherent in this dilemma, its policy aims at building ports in the Indian Ocean Region (IOR). China has been consistently increasing its overseas commercial interests in the last ten years.

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said the port wouldn't work, it was financed by the China Harbour Engineering Company, one of Beijing's largest state-owned enterprises. With tens of thousands of ships passing by along one of the world's busiest shipping lanes, the port drew only 34 ships in 2012. And then the port became of China.

[75]China Power Team, 2017.

[76]See Section 2.3 Overview of Maritime Security Challenges in Southeast Asia.

[77]*After the Gulf of Aden was classified as a war risk area due to piracy in 2008, war risk premiums surged from $20,000 to $150,000 per voyage in 2010. These costs, in combination with the multitudinous risks associated with sailing through a conflict zone, may prompt shippers to significantly reroute commercial traffic* (China Power Team, 2017).

[78]War risk premiums correlate to hull values, and in many cases a starting point for coverage is pegged at 0.1 percent of a vessel's hull value.

[79]United States Energy Information Administration.

China saw its strongest annual growth of outbound foreign direct investment (ODI)[80] in 2016 as its non-financial ODI flows surged by 49.3% to USD 181.2 billion[81]. Moreover the ODI excluded financial sector significantly outpaced inbound foreign direct investment (FDI) in 2016, which amounted to USD 123.4 billion in 2016.However, the upswing of China's ODI suddenly came to a halt[82] in 2017 as the non-financial ODI dropped by 33.7% to USD 120.1 billion. Even though the decline of ODI is broad-based, the authorities continued to stress its commitment and determination to press ahead with its new national strategy of the BRI, with China's ODI flow to the 65 BRI countries remaining stable at USD 14.4 billion in 2017[83].

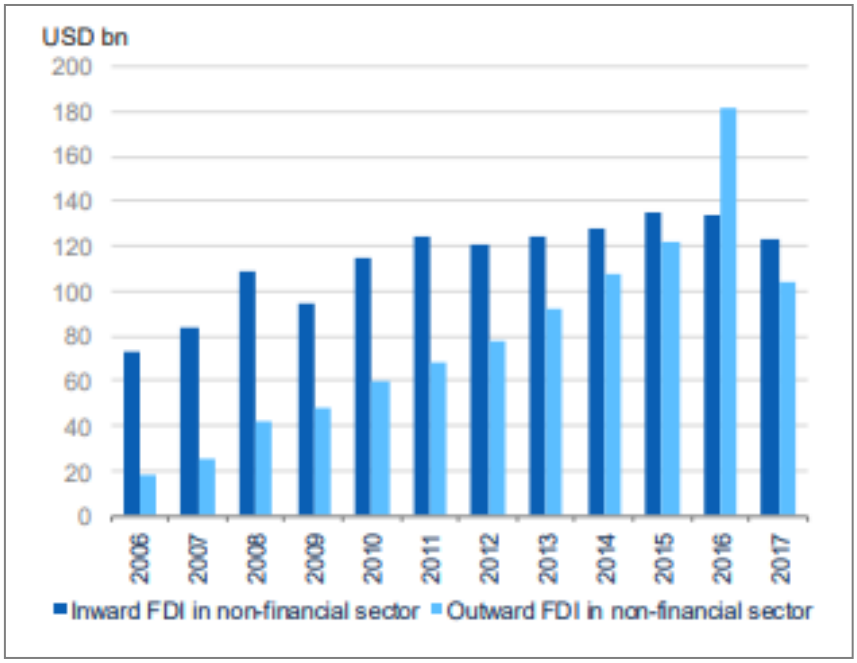


Figure15. Chinainvestment in keyareastied to theBeltandRoadInitiative (BRI) in 2017[84].

[80]An outward direct investment (ODI) is a business strategy in which a domestic firm, or for instance, a country, expands its operations to a foreign country. The extent of a nation's outward direct investment can be seen as an indication that its economy is mature. There is growing evidence that outward foreign direct investment (OFDI) can increase a country's investment competitiveness, crucial for long-term, sustainable growth. Because of their more rapid growth rates, emerging market economies often receive large amounts of ODI.

[81]The high growth can be understood when looking at some of the projects where China planned to invest as part of the BRI. In April 2015, Pakistan and China announced their intention to develop the $46 billion China–Pakistan Economic Corridor (CPEC) and it was in June 2016 that the China Overseas Port Holding Company began the construction of the Gwadar Special Economic Zone, worth $2 billion.

[82]The slump was due to the authorities' restrictive measures to curb ODI as the fast rise in capital outflows, including ODI, posed a threat to the country's financial stability.

[83] Huang, B.; Xia, L., 2018.

[84]Huang, B.; Xia, L., 2018.

A large chunk of China's ODI is concentrated in Asia and Africa. Apart from this, China is also partnering various countries of the Indian Ocean littoral in development of large infrastructure projects. Chinese investments in infrastructure projects have seen a sharp rise in the recent past. The Chinese have invested heavily in big transnational projects like the China Pakistan Economic Corridor (CPEC) or the oil and gas pipelines from Myanmar to China. The $2.5 billion invested in the China – Myanmar pipeline has been entirely covered by the state-owned oil company, China National Petroleum Company (CNPC), which also owns this key infrastructure.[85]

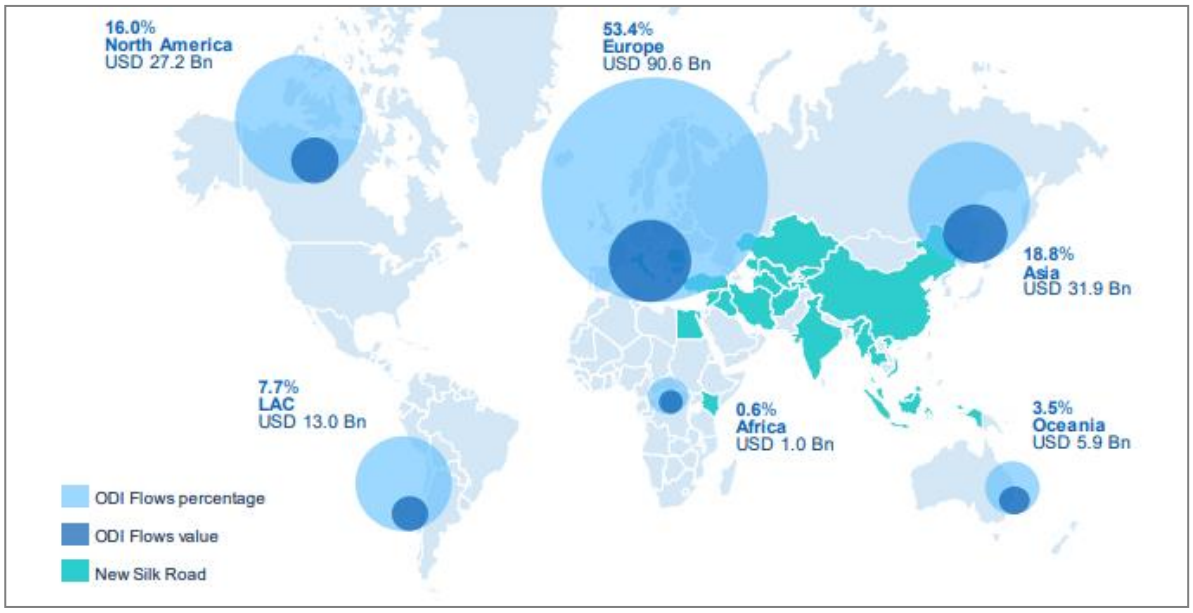


Figure16. Distribution of Chinese ODI flowsandstocks in 2017[86].

China has also invested in port facilities in countries such as Myanmar (Sittwe and Kyaukpyu), Pakistan (Gwadar), Sri Lanka (Hambantota) and Bangladesh (Chittagong)[87].However, the results of the Chinese investments on those states had been diverse. While the ports of Myanmar and Bangladesh registered an increase on the arrivals of vessels after the investment[88], the case of the port of Hambantota has been radically different. Sri Lanka borrowed heavily to build the port but could not repay the loans and ended giving it to China. Major shipping lines route cargo through Colombo and don't divert operations south to Hambantota. Even though the traffic has increased since China took over the port, Hambantota is only handling about one ship a day. The

[85]Gopal, S., 2016.
[86]Huang, B.; Xia, L., 2018.
[87]Jash, A., 2017.
[88] See Annex 2. Statistics of ports in the Belt and Road Initiative

port's weak performance has fuelled impressions that it simply serves China's broader strategic interests to secure crucial trade routes and international supply chains.

There is a shortage of infrastructure investment to meet the needs of developing nations across the Indo-Asia-Pacific region and most nations have welcomed the opportunity to bid for Chinese funding. At the same time, there are growing questions about the economic viability and the geopolitical intentions behind China's proposals. Thus far the Maritime Silk Road initiatives have mainly been concentrated in the littoral states of the Indo-Pacific region, especially in port development projects, which is raising questions about whether these investments are of economic or military in nature. These large-scale investments are also structured in ways that invite questions about the potential for China to exert undo leverage over the domestic and foreign policies of heavily indebted recipient countries[89].

It is noteworthy that China experienced double-digit growth in real gross domestic product (GDP) over much of the 1980s through the 2000s, and its energy demand more than tripled during that time. However, in the past years, Chinese economic growth has slowed as well as its energy demand. The industrial composition of China's economy has moved toward the production of more highly-refined manufactured goods and general services; its economic development has a measurable impact on energy markets in other countries. In particular, more growth occurs in other countries to meet growing purchases from Chinese citizens who have rising incomes[90]. As the following chart displays, while in 2005 energy concentrate the largest part of ODI's flow, it can be seen the progressive shift to other parts of the industry, such as commodities, logistics or transport.

[89]Green, M. J., Cooper, Z., Funaiole, M., Gale, J. B., Hillman, J., Kanwal, G. & Shearer, A., 2018.
[90]EIA, U., 2018.

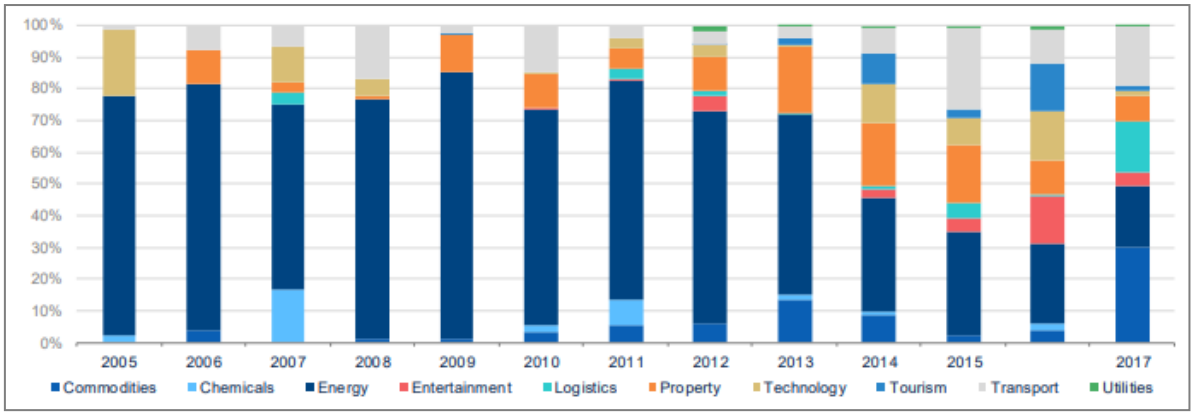


Figure17. China's ODI flowbyindustryandregion[91].

Despite the uncertain global political and economic environment, outbound investment by Chinese firms is likely to rise over the long term, in an effort to boost Belt and Road Initiatives and support of overseas acquisitions. Continued growing investment and trade links between China and BRI countries are expected amid connectivity improvement in the next few years.

China's priority for foreign investment is the ASEAN; in the 16th China-ASEAN leaders meeting they agreed to expand both their two-sided trade to one trillion U.S dollars by 2020. The effects of the investments in the countries of the BRI project, especially the ASEAN countries, are notorious.

The following chart displays a comparison of the Liner Shipping Connectivity Indexes (LSCI) for each ASEAN state member[92].This index aims at capturing a country's level of integration into the existing liner shipping network by measuring liner shipping connectivity; it can be considered a level gauge of the accessibility to the global trade. The LSCI shows how well countries are connected to global shipping networks based on the number of ships, the container-carrying capacity, the maximum vessel size, number of services and number of companies that deploy container ships in country's ports.

The higher the index, the easier it is to participate to international trade; it reflects the strategies followed by the container shipping lines to maximize revenue through market coverage. The countries that have the highest LSCI values are always the ones actively involved in trade, namely China, Hong Kong or Singapore; these export-oriented economies always rank first. Large traders such as Germany, South Korea, Japan or the United States rank among the top 15, and usually,

[91]Huang, B.; Xia, L., 2018.
[92]See Annex 3. ASEAN Liner Shipping Connectivity Index Comparison.

countries such as Spain, Egypt or Malaysia also rank high because the performance of their ports as transhipment hubs.

The Belt and Road Initiative is, essentially, a project aimed to interconnect even more the regions that participate in it so; by looking at the index of each state member of the ASEAN, which participate in the Chinese Initiative, and comparing their evolution, the level of impact on the region can be easily displayed.

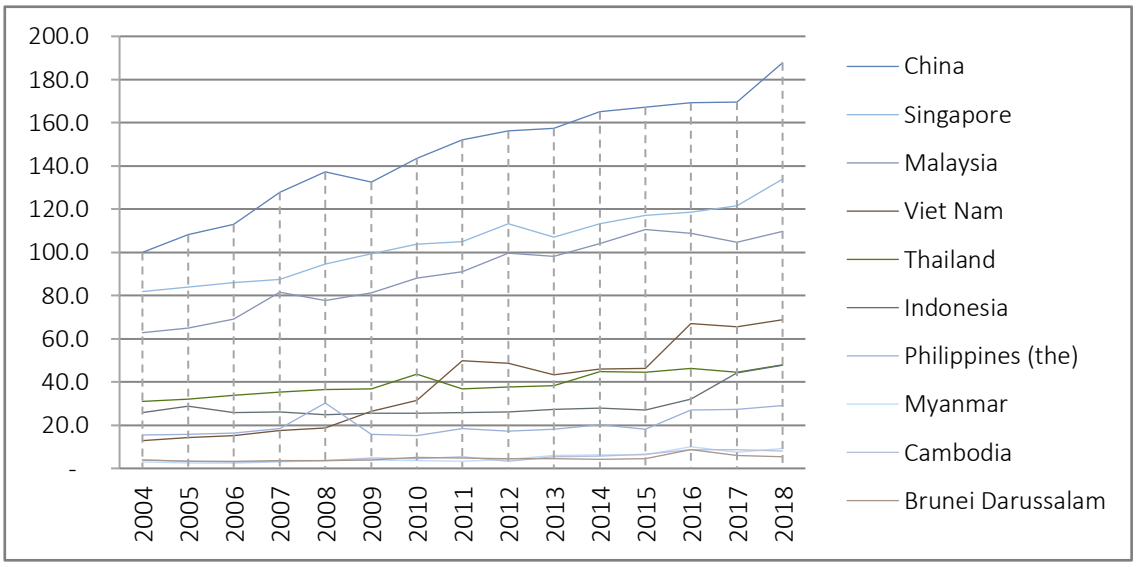


Figure18. China& ASEAN LinerShippingConnectivityIndexComparison[93].

All the state members have observed a steady increase during the last decade, even though the crisis of 2008. Using China and Singapore, the two first top countries of the rank in 2018, as reference, it is clear that even when the ASEAN states are yet far from reach their same level, the tendency is clear upward. Furthermore, since 2013, the year when the Belt and Road Initiative was announced, it shows a further growth, following the path of China.

[93]Self-creation; elaborated with the data assessed by the United Nations Conference on Trade and Development (UNCTAD). Retrieved from: http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=92

CHAPTER5. Alternate routes to the Malacca Strait.

The Asia-Pacific region scores for over 40 percent of global GDP and, almost one-third of the world's merchandise exports[94]. The Malacca Strait, together with the Straits of Sunda and Lombok, constitute the essential linkage for Indo-Pacific trade. The Malacca Strait is now, or is destined to be, the world's most important strait. A disruption in the Malacca Strait would financially impact approximately 400 shipping lanes that link 700 ports worldwide[95].

When considering alternate routes to the Malacca Strait, either because of risk of surpassing its carrying capacity or because of a forced closure, the most immediate and proximal alternatives are the Straits of Lombok and Sunda; at some point, the overwhelming congestion in the Straits of Malacca will force ships to take these detours.

Figure 19.Geographical position of Sunda and Lombok Straits[96].

[94]Huang, B.; Xia, L., 2018.
[95]ERIA, 2016.
[96] Retrieved from: https://twitter.com/nitingokhale/status/965908822480031744

5.1 Overview

Indonesia is theworld'slargestarchipelagicstate[97], formed by more than 17,000 islands. It owns all waters between islands enclosed by its archipelagic baselines. One of its distinctive features is that the state exercises sovereignty over the waters between the islands making up the country's territory.[98]

WiththeIMO'sapproval, Indonesia has designatedthreearchipelagicsea-lanes or *AlurLautKepulauan Indonesia* (ALKI) throughwhichforeignvessels can pass, includingthe Sunda and Malukustraits.Another busy ALKI is the Lombok Strait – between Lombok and Bali islands – that accommodates shipping from Pacific countries and northern Australia bound for Singapore, main land China and Hong Kong.

5.2 SundaandLombok Strait

Sunda Strait lies between Java Island and Sumatra Island. This Strait connects Indian Ocean and Java Sea and it is one of the most important straits in Indonesia. In fact, the sea route through the Straits of Sunda was the preferred route back when sailing ships still rule the seas, because of the wind currents.

However, the strait's narrowness, shallowness, and lack of accurate charting make it unsuitable for many modern large ships, most of which use the Strait of Malacca instead. Ships with deep drafts and over 100,000 deadweight tonnage (DWT) usually do not transit the strait. Sunda strait

[97]Indonesia was not born as an archipelagic state. Until the mid-fifties all waters lying between the islands of Indonesia were not owned by any state. As consequence, Indonesia saw its territory split and separated by the sea. In 1957, Indonesia's government declared that they had absolute sovereignty over all the waters lying within straight baselines drawn between the outermost islands of Indonesia. The implications that this declaration might have for the free movement of ships through the archipelago, as well as for the access to fishing grounds, alarmed neighbouring states. At that moment the Indonesian government could not overcome the challenge, but its situation improved in 1982, when the United Nations Convention on the Law of Sea formally recognized the existence of the archipelagic states, and declared that they had sovereignty over their archipelagic waters. Finally, in 1988, all States left formally recognised Indonesia and its waters.

[98]Butcher, John G.; Elson, R. E., 2017.

is only 20 meters deep at the east end, which is less than a Suezmax[99] draft depth of 20.1 m; Malaccamax[100]vessels see themselves affected in some points, so in either case, it would be necessary to do lot of sea dredging to enable the larger ship to pass through it. Furthermore, this detour would bypass the Port of Singapore, which is really developed as a hub, having a seaportcapable to handle large cargo. About 3,500 ships, equal to 15 million metric tons of good, pass through the strait annually[101].

The Lombok Strait in Indonesia is wider, deeper, and less congested. It is located between the islands of Bali and Lombok. The minimum passage width of Lombok Strait is 11.5 miles and the depth is greater than 150 metres. Lombok becomes an alternative and safer route for super tanker. Ships travelling in Lombok Strait usually pass through the Makassar Strait located between Kalimantan and Sulawesi. The strait is 11 miles wide and 600 miles long. It is estimated 3,900 ships transit through Lombok Strait annually. In terms of value, more than 140 MT of goods worth $40 billion pass through the Lombok Strait.

5.3Estimated Cost to Reroute All Malacca Traffic

In case the Malacca Strait is closed due to accidents or terrorist attacks or has congested traffic, the Lombok and Sunda Straits could be viable alternatives. However, the diversion route from the Malacca Strait to the Lombok Strait will increase the distance by 2,500 nautical miles, equal to 168 voyage hours and is estimated to increase the transportation costs by 20 percent[102].

In literature[103] a short-term peacetime Strait of Malacca closure has been considered; the added costs of rerouting have been estimated by calculating average daily voyage costs of various vessels. It was assumed that tankers and bulk carriers exceeding 100,000 deadweight tonnage (DWT) detour through the deep-water Lombok Strait and that all other smaller transiting ships would use the more proximate but shallower Sunda Strait (Figure 20. *Scenario*1). The estimation

[99]Named after the Suez Canal, it refers to medium to large-sized vessels with a deadweight tonnage (DWT) between 120,000 to 200,000.

[100]Term used for largest vessels capable of passing through the Strait of Malacca. They can have a maximum length of 400m, beam if 59m and draught of 14,5m.

[101]ERIA, 2016.

[102]ERIA, 2016.

[103]China Power Team, 2017.

of a week-long closure of the Strait of Malacca resulted in $64.5 million in additional shipping costs.

In the study carried out it was also considered the scenario of multiple SLOC closures; in that case, rerouting all shipping for one week through the Lombok Strait (Figure 20. *Scenario2*) would cost approximately $119 million.

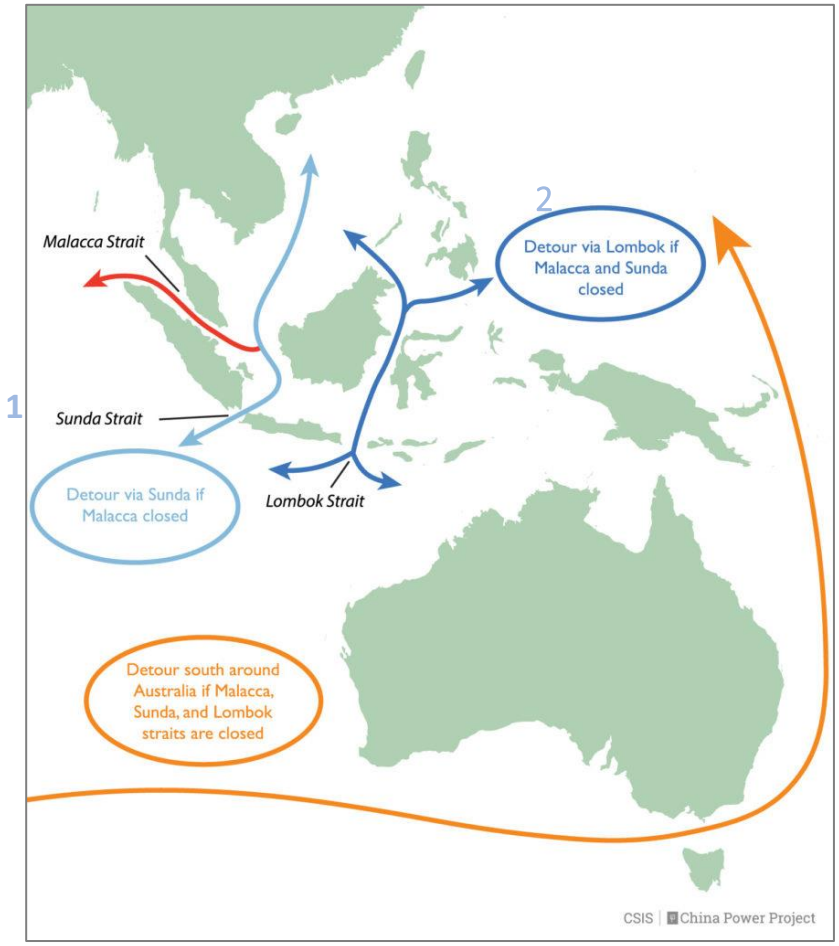


Figure 20.Detours through Sunda and Lombok Straits[104, 105].

The next section also wants to provide some other figures, on a smaller scale, of the cost of rerouting the traffic through the other straits. In particular, the analysis focuses on the

[104]A worst-case planning scenario entails all three straits (as well as other possible Southeast Asian SLOCs) being unavailable for commercial traffic, forcing vessels to sail around the southern coast of Australia before pushing north into the Philippine Sea. This would be analogous to traders rerouting around Africa when the Suez Canal was closed from 1967 to 1974, and would carry a considerable monthly cost of $2.8 billion.

[105]China Power Team, 2017.

calculations done for a hypothetical Liner Company which sees one of its service schedules affected by the closure.

5.4 CaseScenario

This section pretends to calculate how much it would cost to reroute the traffic from the Strait of Malacca to the other two alternatives, the Strait of Sunda and the Strait of Lombok. First, this section shows the estimated cost of rerouting the traffic through the alternatives in one trip and then, it has been proposed a hypothetical Liner Company which sees one of its service schedules affected by the closure.

5.4.1 Case Scenario 1

The object of study is a Container ship of 4.300 TEU; containers have been the major users of the Malacca Strait the past decade and nowadays, lots of vessels with that particulars transit the Strait every year, so the calculations are more realistic.

For cost calculation purposes, a characteristic ship has been obtained from averaging data of some vessel with similar particulars and schedules.

Vesselname	Year of Construction	Lenght (m)	Beam (m)	Draft (m)	Power (kW)	Speed (knots)	Gross Tonnage (GT)
AS Morgana	2010	262,00	32,20	12,50	40680,00	23,30	41331,00
MP TheMcGinest	2010	262,07	32,20	12,50	36160,00	24,10	41391,00
Rio Cadiz	2008	261,00	32,25	13,00	38560,00	24,20	40807,00
Rio Charleston	2008	261,00	32,25	13,00	38560,00	24,20	40807,00
MV Bay Bridge	2010	267,00	35,40	19,50	40530,00	23,50	44234,00
MAERSK Kentucky	1999	292,08	32,25	21,70	46330,00	24,20	50698,00
JPO Vela	2009	265,03	32,30	12,60	40530,00	24,50	41225,00
Derby D	2004	260,00	32,30	11,00	38535,00	18,20	40030,00
Average		266,27	32,64	14,48	39985,63	23,28	42565,38

Table4. 4300 TEUs Container typeships's particulars.

The economies of container ship voyages depend on many factors aside to the ship size. The calculations follow the model established in literature[106], which considers capital costs, RMIA costs, crew costs and fuel consumption costs.

Capital costs dependent on an additional time unit at sea are assessed by means of different formulae based on gross tonnage (GT); the capital cost per day is based on the compensated gross tonnage (CGT) factor[107]:

$$CGT = A\ GT^{B}$$

The daily capital cost is obtained considering a credit at an interest of 5% and a useful and repayment life of 25 years. The annualized capital investment cost equals 3,413,239.4 € for the average ship. Dividing this data by 365 days in a year, the data daily capital cost is obtained. The linear regression equation found is y = 0.63x + 2.6041 that converted to logarithmic scale shows that ln (capital cost) = ln (GT) 0.63 + ln (2.6401).

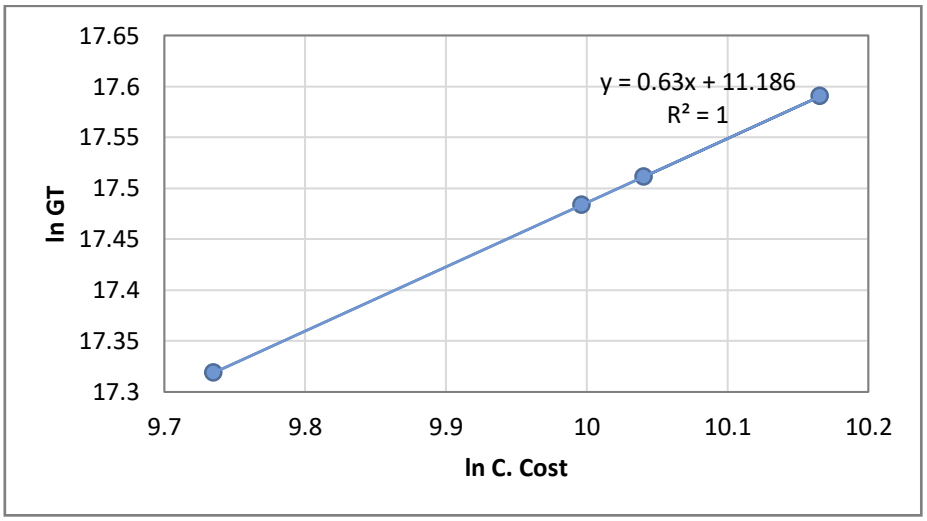


Figure21. Capital Cost.

[106]Grifoll, M., de Osés, F. M., & Castells, M., 2018;

[107] The formula used is taken from the Compensated Gross Ton (CGT) System, from OECD Directorate for Science Technology and Industry in its Council Working Party on Ship building. The factors A and B being 19 and 0,68 respectively.

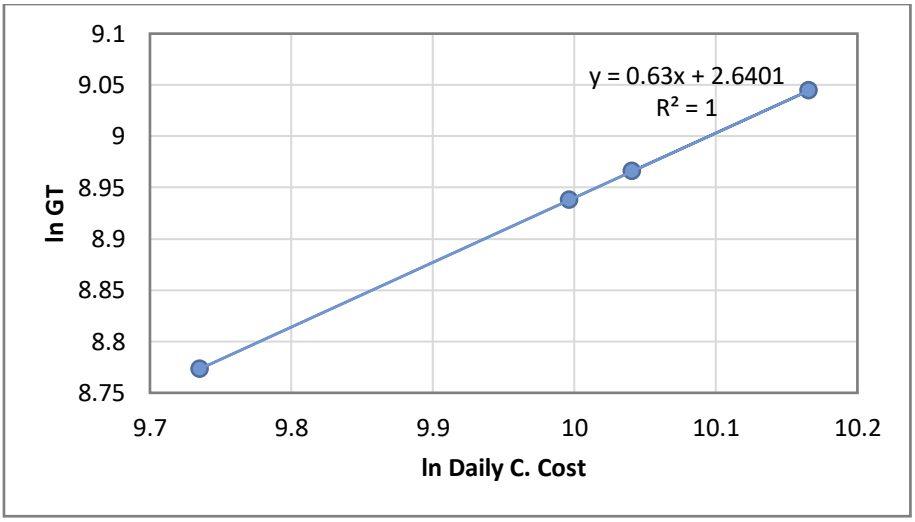


Figure22. Daily Capital Cost.

By means of a Cobb-Douglas conversion, the daily capital cost obtained is:

$$Capital\ cost\ (EUR/day) = 14{,}014 \cdot GT^{0{,}68}$$

Regarding the RMIA costs (Repairs, Maintenance, Insurance and Administrative costs), it has been suggested in literature that it should be around 3,5% of the daily capital costs. The formula is shown below:

$$RMIA\ (EUR/day) = 0{,}4905 \cdot GT^{0{,}68}$$

Regarding crew cost, it is considered that the on board should be eight officers and nine mates, that is, the rotation factor for each category is 2,1 and 1,5 respectively. The average salaries are 3.700€ gross/month for officers and 2.200€ gross/month for mates[108]. The resultant formula of the crew costs is given by:

$$Crew\ Cost = [((Officer's\ Rotation * (Officers's\ Wage) + Mate's\ Rotation * (Mate's\ Wage))/30] * Sailing\ time/24]$$

So in the case scenario, the route chosen is the round trip that serves the ports of Colombo (Sri Lanka), Singapore (Singapore), Shanghai (China), Ningbo (China), Shekou (China), Nansha (China), and Colombo again . The following table depicts the distances of the route with the different straits as well as the days of navigation.

[108]Grifoll, M., de Osés, F. M., & Castells, M., 2018

Country	Port calls	Service type
Sri Lanka	*Colombo*	LINER
Singapore	*Singapore*	
China	*Shanghai*	
China	*Ningbo*	
China	*Shekou*	
China	*Nansha*	
Sri Lanka	*Colombo*	
STRAIT	**Distance (nauticalmiles)**	**Sailingtime (days)**
Malacca	8951,00	23,3
Sunda	12037,39	31,34
Lombok	17523,35	37,59

Table5. Differencesbetweenroutes[109].

As it is showed, the detour through the other straits in the vicinity substantially increases the distance, and for instance, the sailing time.

Considering the distances and the costs explained above, the following table summarized the cost of each route.

	MALACCA	SUNDA	LOMBOK
Distance (nm)	8951,00	12037,39	17523,35
Sailing time (h)	384,58	517,18	752,88
VoyageConsumptionCost	942.248,63 €	1.267.144,93 €	1.844.637,75 €
Voyage Capital Cost	187.376,70 €	251.985,97 €	366.826,89 €
VoyageCrewCost	94.747,47 €	171.352,00 €	363.127,19 €
Voyage f(RMIA)	6.558,18 €	8.819,51 €	12.838,94 €
TOTAL COST	**1.230.930,99 €**	**1.699.302,40 €**	**2.587.430,78 €**

[109]Self-creation.

Percentage of CostIncrement (%)	38,05%	110,20%

Table6. Cost of thedifferentroutes for theaveragevessel.

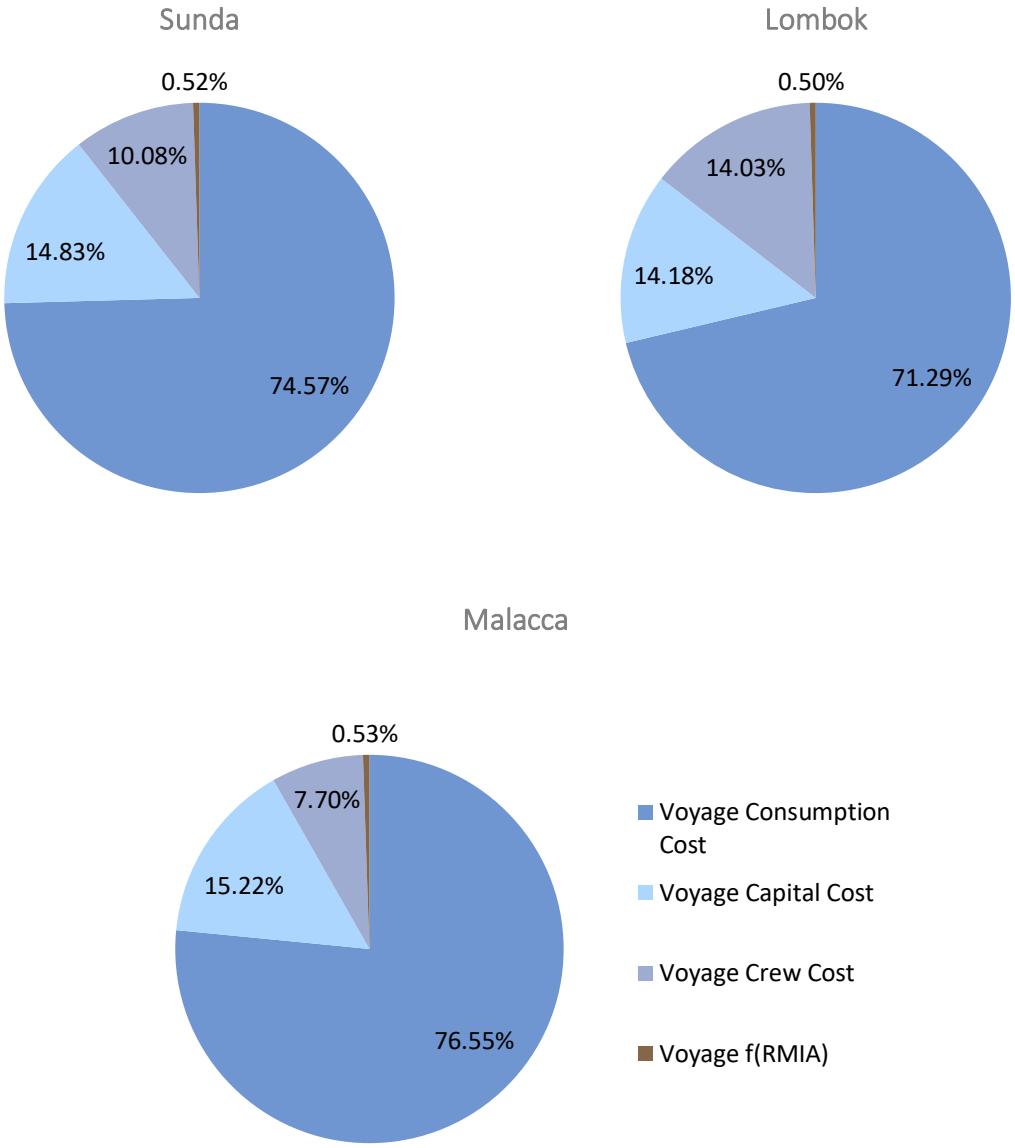


Figure23. Cost distributionusingtheaverageship in theanalyzedroutes.

5.4.2 Case Scenario 2

The assessment of the cost assumed by a Liner Company who sees one of its service schedule affected by the closure has been based on different authors[110]who identify six components of liner service costs: service schedule, ship costs, port charges, container operations, container costs, and administration.

Regarding service schedule, it concerns the service frequency, the number of port calls and the distance, as well as the required number of ships in weekly string. The ship cost is usually expressed in terms of unit slot cost. Operating, capital and fuel costs are important elements, since fuel consumptions is a particularly important variable. Port charges are beyond the control of the ship-owner and vary around the world. Container operations costs depend on the mix of container types, container turnaround time and empty containers that must be repositioned. Container costs include daily cost, maintenance, repair, and handling, among others. Administrations costs are related to management, logistics, financial, and commercial aspects of the business.

1. Ship particulars	
Container-ship size (TEUs)	4250
Gross tonnage	39906
Maximum speed	24,5
Engine Power (KW)	36560
Operating speed terminal to terminal	16
Fuel Consumption (tons/day)	205,8[111]
Time per port call (days)	1,2
2. Service schedule	
Distance of round trip	
Service frequency	weekly
Port calls on round voyage	7

[110]Gkonis, K. G., &Psaraftis, H. N., 2010; Stopford, M., 2004; Cullinane, K. & M. Khanna, 2000.

[111]Using the formula of Case Scenario 1, *Fuel Consumption= Engine Power·Sailingtime·Specific Fuel Consumption·Maximum Continuous Rate*, the consumption is 175,3 tons/day.

Days at sea	
Days in port	8,4
Total voyage time (days)	
Voyage per annum[1]	
Required number of ships in weekly string	4,9
3. Capacity utilization (to calculate the number of loaded containers carried)	
Southbound Capacity Utilization (%)	90%
Northbound Capacity Utilization (%)	70%
Containers shipped outward (TEU)	3825
Containers shipped back (TEU)	2975
Cargo transported by voyage (TEU)	6800
Annual transport capacity per ship (TEU)	78297
4. Ship costs $ per day	
Operating costs $/day	6000
Capital cost/$ day	23863
- Capital value $mill	67
- Depreciation period (years)	20
- Interest rate (%)	8%
Bunker cost ($/day)	85098,3
- Bunker price $/ton (average)[2]	413,5
Total cost per vessel TEU capacity per day ($/day)	457
5. Port & charges (excluding cargo handling)	
Port cost $/TEU	12
Port cost $/call	35000
6. The deployment of containers	
20' containers (% ship capacity)	14%
- Number of units loaded	535,5
40 ' containers (% ship capacity)	80%
- Number of units loaded	3060

Reefers containers (% total)		6%
- Number of 40' units loaded		229,5
Total units on full vessel (all sizes)		3825
Containers turnaround time (days/voyage)		75
Inter-zone repositioning (%)[3]		20,00%
7. The cost of containers and container handling		
Container costs ($/TEU/day)	*20 foot*	0,7
	40 foot	1,1
	40 foot reefer	6
Maintenance & repair ($/box/voyage)		50
Terminal costs per container handling ($/lift)		220
Refrigeration cost per reefer containers ($/TEU)		150
Trans-shipment by sea ($/TEU)		225
Inland intermodal transport cost ($/TEU)[4]		220
Inter-zone re-positioning ($/TEU)		240
Cargo claims ($/box/voyage)[5]		30
8. Administration costs[6]		
Administrative productivity (TEU/employee)		640
Number of employees required		30
Cost/employees $ per annum		60000
Administration cost ($/voyage)		524

Table 7.Building blocks of liner costs (Vessel size (TEU) 4.300)[112].

[1] *In the calculations it has been assumed that a year has 360 days.*

[2]*Selected on 24rd of May 2019 in Singapore (Shipandbunker.com) reaching for IFO380 the 413,5 $/ton.*

[112]Stopford, M., 2008. The table has been modified with the particulars of the vessel in the case scenario.

[3]*It has been assumed a 20% of inter-zone repositioning as an estimation of what industry demands nowadays.*

[4]*It has been assumed a 20% as the estimated amount the ship-owner will carry out the inland intermodal transport.*

[5]It has beenconsidered a 10% of cargo claims.

[6]*It has only been considered the employee costs, depreciating the other costs.*

The template used to make the calculations is shown inTable 7, and have been complimented with the particulars of the vessel. Due to that the major part of the costs depicted remain constant, the time taken on the voyage and the distance travelled on that voyage are the two causal factors which have a strong effect on costs when considering a detour. So in the case scenario, the route chosen is the same as in Case Scenario 1 (Table 5).

The following figures (Table 8, Table 9, and Table 10) show the costs and the total cost of each route.

It is important to remark that for the sake of the comparison the total number of voyages per annum has remained constant, even when the a greater distance means more sailing time and consequently less voyage per year. It was assumed in that way to show what would suppose in terms of costs for the ship-owner to maintain the same conditions of service.

Annual Ship costs $	
Operating Cost	$2.160.000,00
Capital Cost	$8.590.680,00
Bunker Cost	$31.060.879,50
Annual Port & charges (excluding cargo handling)	
Port cost ($)	$2.820.977,92
The cost of containers and container handling	
20 foot Cost	$2.800.666,88
40 foot Cost	$25.148.845,43
40 foot reefer Cost	$10.288.164,04

Maintenance & repair	$45.076.077,98
Terminal costs	$17.225.236,59
Refrigeration cost per reefer containers ($/TEU)	$704.668,77
Trans-shipment by sea ($/TEU)	$17.616.719,24
Inland intermodal transport cost ($/TEU)	$3.445.047,32
Inter-zone re-positioning ($/TEU)	$3.758.233,44
Cargo claims	$2.704.564,68
Administration costs	
Cost/employees $ per annum	$1.800.000,00
TOTAL	**$175.200.761,78**

Table 8. Annual Cost Malacca Strait.

Annual Ship costs $	
Operating Cost	$2.160.000,00
Capital Cost	$8.590.680,00
Bunker Cost	$38.888.309,89
Annual Port & charges (excluding cargo handling)	
Port cost ($)	$2.817.500,00
The cost of containers and container handling	
20 foot Cost	$3.502.119,92
40 foot Cost	$31.447.607,46
40 foot reefer Cost	$12.864.930,32
Maintenance & repair	$44.965.000,00
Terminal costs	$17.204.000,00
Refrigeration cost per reefer containers ($/TEU)	$703.800,00

Trans-shipment by sea ($/TEU)	$17.595.000,00
Inland intermodal transport cost ($/TEU)	$3.440.800,00
Inter-zone re-positioning ($/TEU)	$3.753.600,00
Cargo claims	$2.697.900,00
Administration costs	
Cost/employees $ per annum	$1.800.000,00
TOTAL	**$192.431.247,59**

Table 9. Annual Cost Sunda Strait.

Annual Ship costs $	
Operating Cost	$2.160.000,00
Capital Cost	$8.590.680,00
Bunker Cost	$45.003.649,33
Annual Port & charges (excluding cargo handling)	
Port cost ($)	$2.817.500,00
The cost of containers and container handling	
20 foot Cost	$4.052.842,03
40 foot Cost	$36.392.867,22
40 foot reefer Cost	$14.887.991,14
Maintenance & repair	$44.965.000,00
Terminal costs	$17.204.000,00
Refrigeration cost per reefer containers ($/TEU)	$703.800,00
Trans-shipment by sea ($/TEU)	$17.595.000,00
Inland intermodal transport cost ($/TEU)	$3.440.800,00
Inter-zone re-positioning ($/TEU)	$3.753.600,00

Cargo claims	$2.697.900,00
Administration costs	
Cost/employees $ per annum	$1.800.000,00
TOTAL	**$206.065.629,72**

Table 10.Annual Cost Lombok Strait.

Based on the difference in time between the minimum distance route, the one through the Strait of Malacca, and the other two feasible alternatives, Table 6 shows the different costs due to the additional sailing time, the total cost (in Dollars and Euros[113]) and the associated percentages.

	SUNDA	LOMBOK
Additional fuel costs ($)	$7.827.430,39	$13.942.769,83
Additional container & container handling costs ($)	$9.406.533,34	$16.925.576,03
Total additional costs ($)	$17.230.485,81	$30.864.867,94
Total additional costs (M€)	↑15,35 M €	↑27,47M€
Percentage of cost increment (%)	↑ 9,83%	↑ 17,62%

Table 11. Costs assumed for the different scenarios.

Even when the Sunda and Lombok Strait are physical viable alternatives, the extra cost of detour makes them inadequate as a long-term solution. The delays as well as the cost that ship-owners would need to assume could have far-ranging economic consequences for the global marketplace. Interregional trade routes and multinational production hubs geographically tied to the region would be affected; the damage done to the Southeast Asian manufacturing sector could cripple the global supply chain and could drop worldwide production, while global prices would increase.

[113]Selected on 24rd of May 2019 the $/€ parity of 1$=0,89€.

CONCLUSIONS

The Strait of Malacca is one of the key points for the transit of energy products to the countries of Southeast and East Asia. The 890 km strait that divides Indonesia and Malaysia is less than three kilometres wide at its narrowest point near Singapore, forming a natural bottleneck. It is the second-largest oil choke point in the world after the Strait of Hormuz. Its characteristics make of it a threat for the safety of navigation as the danger of collisions, groundings, or oil spills increases due to the narrowness of some points of the strait. Furthermore, its geographical position makes it especially vulnerable to threats of piracy and terrorism.

Besides serving the strategic needs of the littoral states, China, Japan, and South Korea are reliant on this strategic waterway for their supplies, especially energy; in recent years, between 85% and 90% of annual total petroleum flows through this chokepoint was crude oil. This is especially true for China, as more than the 80 percent of its oil imports passed through the South China Sea via the Strait of Malacca in 2016. Some years ago, turbulence in Chinese economy would have not mattered as much as it does now. Nowadays China accounts the 19% of global economic activity. Its economy is now so large that it pretty much determines the global price of a huge range of products. Even though its economy has been showing a slowdown after three decades of rapid growth, deepened by the trade war with U.S., its energy needs are expected to increase exponentially in the coming decades.

China is seeking alternative routes to reduce its dependence on the waterway to secure a more viable long-term energy security policy. As part of its Belt and Road initiative, China is developing several major new routes that are likely to reduce its dependency on the Malacca Straits as well as will consolidate its position over the region. Projects such as is China's trans-Myanmar oil and gas pipelines, the Pakistan-China Economic Corridor or the

proposals to develop two land-bridges - including an oil pipeline and a railway - linking ports on the west and east coasts of the Malay Peninsula are aimed to bypass the Malacca Straits.

Despite the uncertain global political and economic environment, the ASEAN states and China have become in the last decades key partners regarding trade, investment and infrastructure development. The prevalence of the Belt and Road Initiative as the only existing major integration initiative with a global framework, have increased the willingness of the countries and regions to cooperate in its economic alliance. The effects of the connectivity project have started to be relevant for the ASEAN economies as well as for the Malacca Strait itself.

As the Liner Shipping Connectivity Index shows, all the ASEAN states members have observed a steady increase during the last decade, even though the crisis of 2008. ASEAN region is improving accessibility to the global trade, despite being yet far from reach the same level as China and the tendency is clearly upwards for the years to come.

On the other hand, the Malacca Strait has been following a tendency of continued growth, hitting an all-time high of 85030 transits in 2018. However, comparing this decade with the last one, growth rate shows a deceleration in the increase of shipping traffic. It might be considered the declining growth rate and the decrease in the accidents in the Straits as consequences of the Belt and Road Initiative. The improved interconnectivity has had an impact on the Malacca Strait, as it was intended, delaying the moment when the Malacca Strait is going to hit its maximum carrying capacity.

Even when China is actively seeking to diversify energy routes to reduce its dependence on the Strait of Malacca, the strategic waterway remains the best route compared to its alternatives. Detouring the traffic form the Malacca Strait to its feasible and closest alternatives, the Sunda and Lombok Straits, supposes an increase of distance as well as fuel consumption. In Scenario 1, the percentage of cost increment goes from 38%, in the Sunda Strait, to a 110% in Lombok Strait. This significant difference is due to that the voyage consumption cost represents, approximately, the 75% of the total cost. However, calculations made in Scenario 2, which take into account a bigger range of components of cost, show that for a Liner Shipping Company with a line service in the Southeast Asian Region, the added costs of rerouting would increase from 9% to 18%.

It is clear that there is not a satisfying solution to the Malacca Dilemma yet, and it seems that this situation would not change in the near future. However, China has not stopped here and is looking to ensure a more viable long-term energy security policy.

Climate change, in particular the melting ice, has opened new sea routes through the North Pole. The Arctic awakens commercial interests in many large companies and coastal and non-coastal states, given their natural resources and the savings they entail in the transport of goods between continents. China has also expressed interest in Arctic shipping routes along the Northern Sea Route and through the Northwest Passage. The shortest route from China to Rotterdam for example, is by using the Northern Sea Route, which can save up to 13 days. This translates into cost savings due to transport efficiency and considerable fuel savings.

The Arctic route reduces the risk of oil disruption for China, Japan and South Korea. The capacity to ship oil and gas from ports along the Northern Sea Route also reduces the need to build costly pipelines across the tundra for land-based energy transport. The fact that rivers in Russian Siberia flow north to the Arctic Ocean also allows these waterways to be used to ship oil and other resources to coastal ports. Using the Northern Sea Route that connects Northern Europe with China, Taiwan, South Korea and Japanwill suppose a 40% reduction in sailing distance, and a 20% cut in fuel, compared with the Suez Canal route via the Middle East[114].

Even though analysts say that the transit will be increasingly easy to navigate for bulk carriers, even during winter months when ice levels are highest, navigating these routes will always involve a series of limitations and risks. The draft due to the shallowness in some navigation areas, the fact that they are only navigable for 3-5 months of the year, the lack of infrastructure and rescue, due to the long distances to supply and lack of investments, and communication problems due to high latitudes difficult the navigation.

A further route, still under discussion, is the proposal to build a canal across the Isthmus of Kra in southern Thailand[115]. The canal would allow shortening maritime traffic by a distance of approximately 1,000 nautical miles.

[114]Rahman, N. A., Saharuddin, A. H., & Rasdi, R., 2014.

[115] At north of the Thai-Malaysian border lies the Isthmus of Kra, which links the Malay Peninsula with the rest of Southeast Asia. This peninsula, only 130 kilometers wide, separates the Gulf of Thailand, in the sea of

Although the channel project has not been officially part of the Belt and Road initiative and there has been political resistance, there have been unconfirmed talks between commercial parties in China and their counterparts in Thailand.

No one knows exactly how much oil and gas will go through the alternative routes and how much time will they take their final destinations. Other question marks include insurance charges and storage facilities. It would remain to be seen if the relative economic costs, even when the physical distance is reduced, would be competitive compared with the Malacca Strait.The accurate determination of the economicbenefit considering these other alternatives is considered as future works.

The China-proposed and funded Belt and Road projects will undoubtedly alter the traditional trading routes in the region. However, just as in ancient times, the Malacca Strait will continue to remain a key focus for China in the near future.

South China, of the Andaman Sea, in the Indian Ocean. The idea was, for the first time, promoted in Thailand by the brother of King Rama I,in 1793; Since then, periodically the idea has been revived and re-studied, discarding or postponing due to its high cost and doubts about its feasibility.

BIBLIOGRAPHY

Amri, A. A. (2016). Maritime Security Challenges in Southeast Asia: Analysis of International and Regional Legal Frameworks.

ASEAN. *Association of Southeast Asian Nations* (17 of January, 2019) Retrieved from: https://asean.org/asean/about-asean/

Blanchard, J. M. F., & Flint, C. (2017). The geopolitics of China's maritime silk road initiative.

Butcher, John G.; Elson, R. E. (2017, 11 of May).*How did Indonesia become and archipelagic state?* The Strategist, Australian Strategic Policy Institute. Retrieved from: https://www.aspistrategist.org.au/indonesia-became-archipelagic-state/

Chew, E. P., Lee, L. H., & Tang, L. C. (2011). *Advances in Maritime Logistics and Supply Chain Systems*.World Scientific.

Chin, H., & He, W. (2016). The Belt and Road Initiative: 65 countries and beyond. *Hong Kong: Fung Business Intelligence Centre*.

China Power Team. (2017, August 2) *How much trade transits the South China Sea?* Retrieved from: https://chinapower.csis.org/much-trade-transits-south-china-sea/

Cullinane, K. and M. Khanna, (2000), "Economies of scale in large containerships: optimal size 19 and geographical implications", Journal of Transport Geography, 8: 181-195.

Du, M. M. (2016). China's "One Belt, One Road" initiative: Context, focus, institutions, and implications. *The Chinese Journal of Global Governance*, *2*(1), 30-43.

EIA, U. (2018). Energy implications of China's transition toward consumption-led growth. *US Energy Information Administration, Washington, DC*.

ERIA(2016), 'Sea lane security in the selected EAS countries', in Kimura, S., T. Morikawa and S. Singh (eds.), *Sea Lane Security of Oil and Liquefied Natural Gas in the EAS Region*. ERIA Research Project Report 2015-14, Jakarta: ERIA, pp.41-55.

Gaynor, J. L. (2014). Maritime Southeast Asia: Not Just a Crossroad. *Education About Asia* (*19:2*), 47-48.

Gerke, Solvay & Evers, Hans-Dieter &Hornidge, Anna-Katharina. (2008). The Straits of Malacca: knowledge and diversity.

Gkonis, K. G., &Psaraftis, H. N. (2010). Some key variables affecting liner shipping costs. *Laboratory for Maritime Transport, National Technical University of Athens*.

Gopal, S. (2016).*China's 21 Century Maritime Silk Road: Old String with New Pearls?* Vivekananda International Foundation. Retrieved on December 21, 2018 from: https://www.vifindia.org/sites/default/files/china-s-21st-century-maritime-silk-road-old-string-with-new-pearls.pdf

Green, M. J., Cooper, Z., Funaiole, M., Gale, J. B., Hillman, J., Kanwal, G. & Shearer, A. (2018). *China's Maritime Silk Road: Strategic and Economic Implications for the Indo-Pacific Region*. Center for Strategic & International Studies.

Grifoll, M., de Osés, F. M., & Castells, M. (2018). Potentialeconomicbenefits of using a weathershiproutingsystemat Short SeaShipping. *WMU Journal of MaritimeAffairs*, *17*(2), 195-211.

H.E. Xi Jinping (2019)*Working Together to Deliver a Brighter Future For Belt and Road Cooperation,* Opening Ceremony of the Second Belt and Road Forum for International Cooperation, Beijing. Retrieved from: http://www.beltandroadforum.org/english/n100/2019/0426/c22-1266.html

H. M. Ibrahim; Mansoureh Sh., (2015) Analysis of Carrying Capacity and Critical Governance Strategies for the Straits of Malacca.Maritime Institute of Malaysia.

Hamilton, M.; Villar, L. (2017, August 11). *The Strait of Malacca, a key oil trade chokepoint.*

Honna, J., 2013. ASEAN-Japan Cooperation on Maritime Non-Traditional Security Issues: Toward a New Paradigm. In T. Shiraishi& T. Kojima (Eds.), ASEAN-Japan Relations (pp. 96-113)

Huang, B.; Xia, L., (2018) China ODI from the Middle Kingdom: What's next after the big turnaround? BBVA Research, China Economic Watch.

Jash, A. (2017). China's "Blue Partnership" through the Maritime Silk Road.

Liss, C. (2007). The Privatization of Maritime Security-Maritime Security in Southeast Asia: Between a rock and a hard place?

Maritime and Port Authority of Singapore (2017). Operational Areas. Retrieved from: https://www.mpa.gov.sg/web/portal/home/port-of-singapore/operations/vessel-traffic-information-system-vtis/operational-areas

Misachi, J. (2019, 12 of April) *What Is the Significance of A Choke Point?* WordAtlas. Retrieved from: https://www.worldatlas.com/articles/what-is-the-significance-of-a-choke-point.html)

Noer, J. H., & Gregory, D. (1996). *Chokepoints: Maritime Economic Concerns in Southeast Asia*. National Defense Univ. Washington DC Inst. for National Strategic Studies.

Oh, Y., 2017. China's Economic Ties with Southeast Asia. *World Economic Brief, 7.*

Orillaneda, B. C. Maritime Trade in Southeast Asia during the Early Colonial Period.

Pop, I. I. (2016). Strengths and challenges of China's "One belt, One road" Initiative. *Centre for Geopolitics and Security in Realism Studies*.

Rahman, N. A., Saharuddin, A. H., &Rasdi, R. (2014).Effect of the northern sea route opening to the shipping activities at Malacca straits. *International Journal of e-Navigation and Maritime Economy*, *1*, 85-98.

ReCAAP, I. S. C., 2019. Annual Report January to December 2018. *Piracy and Armed Robbery against Ships in Asia*.

Rees, W. E. (1992). Ecological footprints and appropriated carrying capacity: what urban economics leaves out? Environment and urbanization, 4(2), 121-130.

Rodríguez, J. A. (2018). *The Belt and Road Initiative: A Geopolitical Approach* (Doctoral dissertation).

Sarma, J. (2013, August 13) *The Malacca Dilemma.* Retrieved from: https://csc.iitm.ac.in/articles/malacca-dilemma

Stopford, M. (2004), "Maritime Economics," 2nd edition, Routledge.

Thayer, C. A. (2010). *Southeast Asia: Patterns of security cooperation*. Australian Strategic Policy Institute.

UNCTAD (2018).Review of Maritime Transport 2018.United Nations publication.Sales No.E.18.II.D.5.

United Nations Conference on Trade and Development (UNCTAD). Retrieved from: http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=92

U.S Energy Information Administration. (2017, July 25). World Oil Transit Chokepoints. Retrieved from: https://www.eia.gov/beta/international/analysis_includes/special_topics/World_Oil_Transit_Chokepoints/wotc.pdf

Vavro, C. (2008). Piracy, terrorism and the balance of power in the Malacca Strait. *Canadian Naval Review*, *4*(1), 13-17.

Wang, G. (2017). "Southeast Asia and Continental and Maritime Powers in a Globalised World", Aileen Baviera and Larry Maramis (ed.), B*uilding ASEAN Community: Political–Security and Socio-cultural Reflections*, Economic Research Institute for ASEAN and East Asia.

Wang, J. (2015). China's 'New Silk road': A case study in EU–China relations. *Xi's policy gambles: The bumpy road ahead*, 92-109.

Wieslaw, T. (2012).Origins of ship safety requirements formulated by International Maritime Organization.Procedia Engineering, 45, 847-856.

Wissmann, M. (2010) Aiming for the long term: the prevention of conflict and building peace in the South China Sea. In E. Graham (Ed.), *Proceedings the European Association for South-East Asian Studies (EUROSEAS)*. Stockholm: University of Gothenburg.

Workman, D. 2019, January 24. *Crude Oil Imports by Country*.Retrieved from: http://www.worldstopexports.com/crude-oil-imports-by-country/

Yang, X. J., Low, J. M., & Tang, L. C. (2011).Maritime Trade Evolutions and Port City Developments in Asia.In *Advances in Maritime Logistics and Supply Chain Systems* (pp. 3-48).

Zhao, H. (2015). *China's New Maritime Silk Road: Implications and Opportunities for Southeast Asia*. ISEAS Publishing, Institute of Southeast Asian Studies.

Zhong, Y. (2016). The Importance of the Malacca Dilemma in the Belt and Road Initiative. *Journal of policy science*, *10*, 85-109

Annex 1. *Statistics of the Malacca Strait*.

TYPE AND TOTAL OF VESSEL REPORTING TO KLANG VTS FROM 2012 TO 2019								
TYPE	*Year*							
	2012	2013	2014	2015	2016	2017	2018	2018 (%)
VLCC	4732	4825	4993	5324	5973	6711	7517	8,84%
TANKER Vessel	17345	18296	18765	18470	19466	20629	20610	24,24%
LNG & LPG Carrier	4014	4248	4173	3936	3685	4137	4547	5,35%
CargoVessel	7950	7613	6989	7144	6595	7090	6409	7,54%
Container Vessel	24639	24658	25071	25389	25786	24446	24578	28,91%
BulkCarrier	11678	12658	13454	15168	14307	15411	15390	18,10%
Ro-Ro	2980	2998	3146	3117	5547	2629	2437	2,87%
PassengerVessel	861	1063	1041	925	1125	1776	1969	2,32%
LivestockCarrier	38	55	59	76	67	50	45	0,05%
Tow	529	563	676	467	536	533	601	0,71%
GovernmentVessel	50	58	96	87	46	54	66	0,08%
FishingVessel	52	27	51	53	23	28	36	0,04%
Others	609	911	830	803	714	962	825	0,97%
TOTAL	75477	77973	79344	80959	83870	84456	85030	100,00%

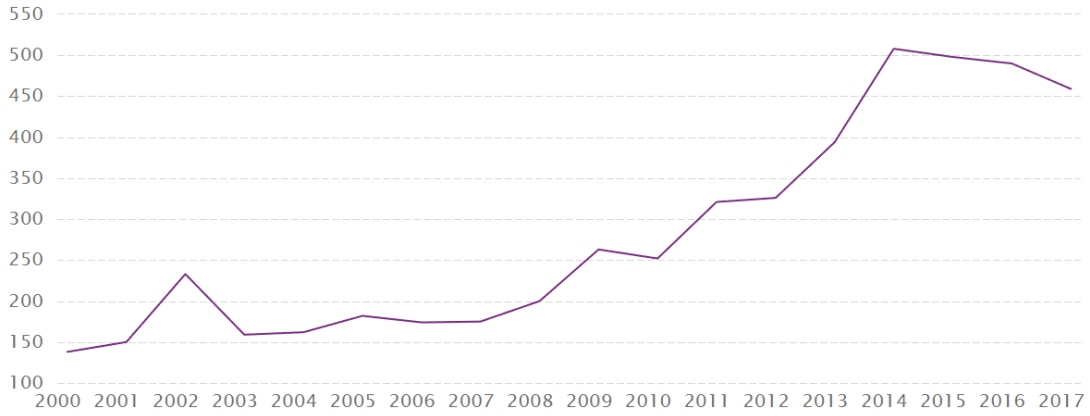
Type and total of vessels reporting to Klang VTS from 2012 to 2019.

GROWTH RATE			
2013	*3,31%*	2016	*3,60%*
2014	1,76%	2017	0,70%
2015	2,04%	2018	0,68%
	Average		2,01%

Growth Rate of shipping traffic from 2012 to 2018.

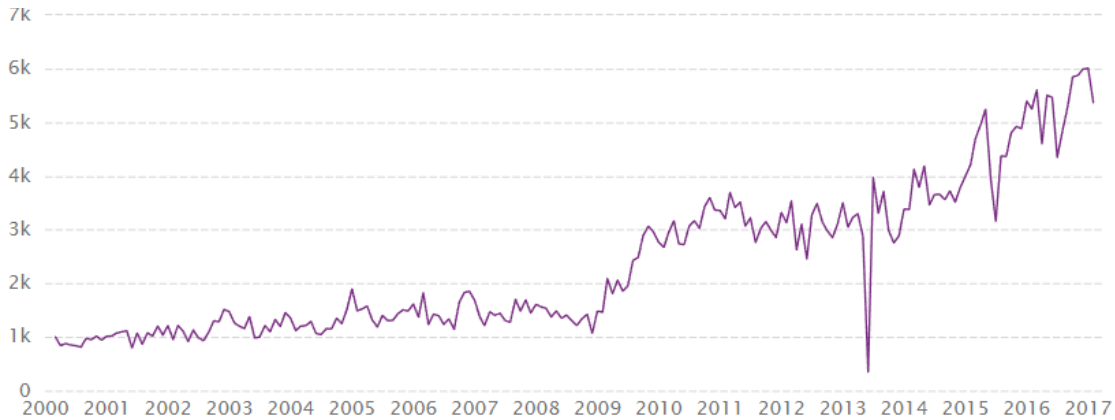
Annex 2. *Statistics of ports in the Belt and Road Initiative*.

SITTWE PORT (Myanmar)



Port Arrivals in units.

CHITTAGONG (Bangladesh)



Cargo Imports in Metric Tons.

Annex 3. *ASEAN Linear Shipping Connectivity Index's Comparison*.

Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
China	100,0	108,3	113,1	127,9	137,4	132,5	143,6	152,1	156,2	157,5	165,1	167,1	169,2	169,6	**187,8**
Singapore	81,9	83,9	86,1	87,5	94,5	99,5	103,8	105,0	113,2	106,9	113,2	117,1	118,5	121,6	**133,9**
Malaysia	62,8	65,0	69,2	81,6	77,6	81,2	88,1	91,0	99,7	98,2	104,0	110,6	108,9	104,8	**109,9**
Viet Nam	12,9	14,3	15,1	17,6	18,7	26,4	31,4	49,7	48,7	43,3	46,1	46,4	66,9	65,6	**68,8**
Thailand	31,0	31,9	33,9	35,3	36,5	36,8	43,8	36,7	37,7	38,3	44,9	44,4	46,4	44,6	**48,0**
Indonesia	25,9	28,8	25,8	26,3	24,9	25,7	25,6	25,9	26,3	27,4	28,1	27,0	32,1	44,1	**47,8**
Philippines (the)	15,5	15,9	16,5	18,4	30,3	15,9	15,2	18,6	17,2	18,1	20,3	18,3	27,2	27,3	**29,0**
Myanmar	3,1	2,5	2,5	3,1	3,6	3,8	3,7	3,2	4,2	6,0	6,3	6,2	10,0	7,4	**9,3**
Cambodia	3,9	3,3	2,9	3,3	3,5	4,7	4,5	5,4	3,5	5,3	5,6	6,7	8,6	8,7	**8,2**
Brunei Darussalam	3,9	3,5	3,3	3,7	3,7	3,9	5,1	4,7	4,4	4,6	4,3	4,6	8,7	6,0	**5,3**

For each component a country's value is divided by the maximum value of each component in 2004, the five components are averaged for each country, and the average is divided by the maximum average for 2004 and multiplied by 100. The index generates a value of 100 for the country with the highest average index in 2004. The underlying data come from Containerisation International Online. Data on trade facilitation are drawn from research by private and international agencies. The data are derived from Containerisation International Online (until 2015) and MDS Transmodal (from 2016 onwards).