

Chapter 2

Risk Analysis on Sea Lane Security of Oil and LNG

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Chapter 2

Risk Analysis on Sea Lane Security of Oil and LNG

2.1. Introduction to Sea Lane Security

While 'energy security' is a malleable concept, international institutions such as the International Energy Agency (IEA) and governments of various countries agree to its core tenets, which are the importance of secure, adequate, affordable and reliable supply of energy (Singh, 2012). A fundamental aspect of energy security is the management of risk, particularly, the risk of interruptions, unavailability of energy, and price volatility. The Society for Risk Analysis defines risk as the potential for the realisation of unwanted, adverse consequences to human life, health, property or the environment.

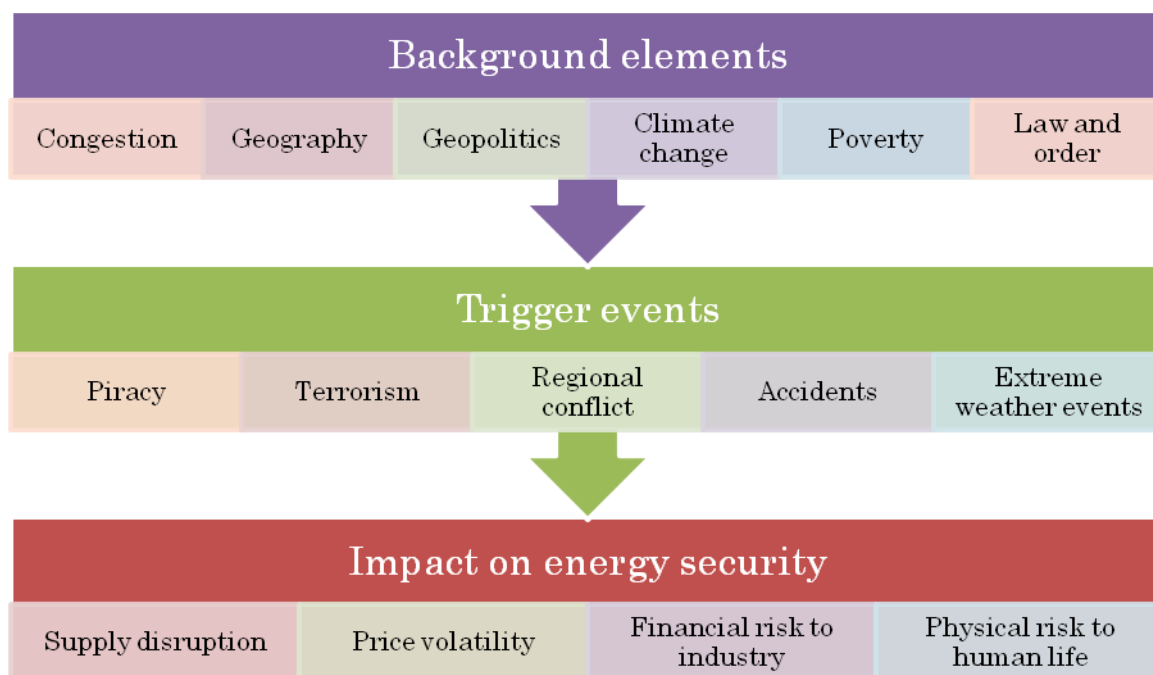
In the case of the global hydrocarbons economy, there emanate serious risks in the supply of petroleum and natural gas. Traded internationally are 42.5 percent of all crude oil produced and 24.8 percent of all petroleum products exported, much of it by sea (BP, 2015). Importing nations – particularly those in Asia – should be cognisant of and provide security in sea lanes where possible, to mitigate risks to affordable and reliable energy supply. Those sea lanes that are key maritime passageways that facilitate heavy shipping traffic volumes and host the transport of strategic goods such as crude oil are called sea lines of communication (SLOC).

The global community agrees that SLOCs must be kept open at all times, even during war and conflict. However, militaries often posture and plan for blockades and any other risks that may disrupt movement in these SLOCs.

In Asia's larger context, the most important sea lanes pass through the choke points of the Straits of Malacca, Singapore, Lombok, and Makassar in Southeast Asia and the Strait of Hormuz and the Persian Gulf. Further, other chokepoints that will become relevant to Asia in the future include the Panama Canal and Bering Strait. Currently, over 14,000 ships navigate the Panama Canal each year, which is likely to grow once canal expansion works are completed (Mitchell, 2011). Trade around the Cape of Good Hope is also relevant to Asia; however, it is not considered a 'chokepoint'.

As represented in Figure 2-1, the key risks to sea lane security are piracy, terrorism, regional conflict, accidents and extreme weather events. In various ways, the background elements of congestion, geography, geopolitics, climate change, poverty and law and order influence these risks, as will be discussed in the following sections.

Figure 2-1. Background Elements of Risks to Sea Lanes, Trigger Events, and Impact on Energy Security



Source: Author.

These risks impact energy security not only by creating supply disruptions and spikes in energy prices, they also can lead to risks to human life, particularly that of energy industry workers, and can impose financial costs to the energy industry, *inter alia*, in the form of higher insurance payments.

The next section explores risks impacting sea lane security and provides geography-specific dynamics of each risk.

2.2. Risks Associated with Sea Lanes

In this report, sea lane risks will be explored theme-wise. The risks under consideration are piracy, terrorism and regional conflict, congestion and accidents, and extreme weather events.

2.2.1. Piracy

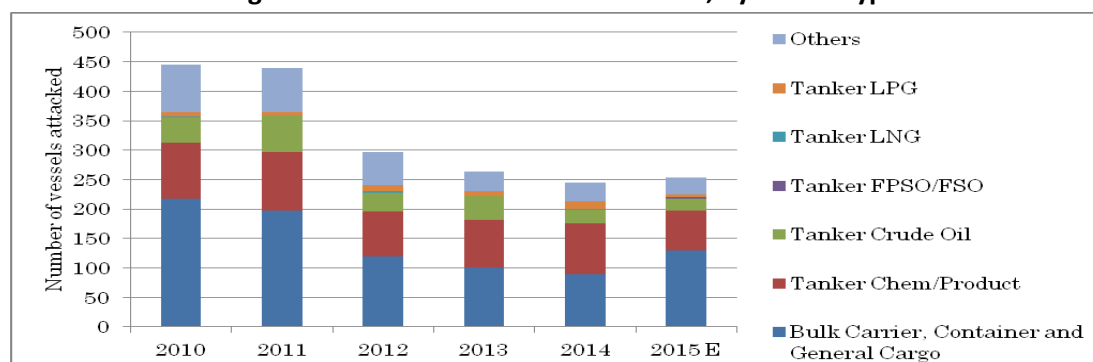
As defined by the United Nations Convention on the Law of the Sea (UNCLOS), piracy consists of, *inter alia*, 'illegal acts of violence or detention, or any act of depredation, committed for private ends by the crew or the passengers of a private ship'. Further, the International Maritime Organisation (IMO) defines 'armed robbery against ships', which are acts including 'violence or detention or any act of depredation, or threat thereof, other than an act of piracy, committed for private ends and directed against a ship or against persons or

property on board such a ship, within a State’s internal waters, archipelagic waters and territorial sea.’

In recent history, piracy and armed robbery has played a role in disrupting the free movement of vessels, causing delays, financial losses, and even loss of life. Data⁵ from the International Maritime Bureau (IMB) of the International Chamber of Commerce (ICC) reveals that globally, acts of piracy and robbery at sea have declined over the past 5 years.

However, importantly, vessels transporting energy products and facilitating energy operations continue to form a prime target of pirates and robbers alike. As shown in Figure 2-2, while total attacks on vessels have been declining, vessels transporting liquefied petroleum gas (LPG), liquefied natural gas (LNG), crude oil, chemicals and products, and floating production storage and offloading (FPSO) tankers continue to be a significant share of targets. In 2014, 51 percent of targets were such ships associated with hydrocarbon trade and allied services.

Figure 2-2. Number of Vessels Attacked, by Vessel Type



Note: 2015 data has been estimated using actual January–September 2015 data.

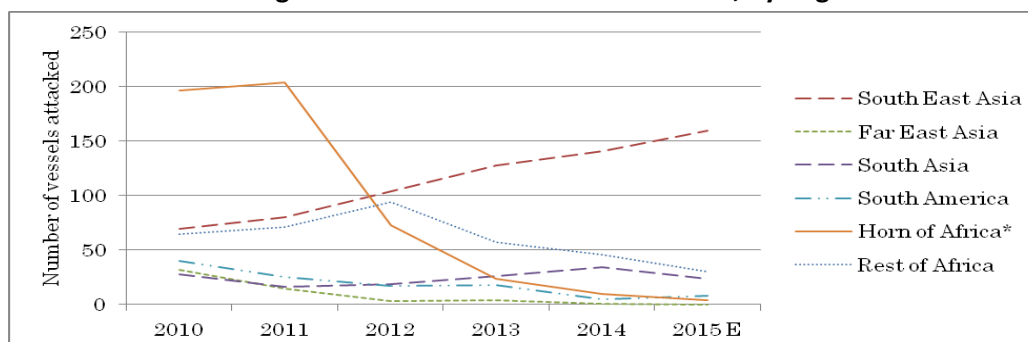
FPSO = floating production storage and offloading; LNG = liquefied natural gas; LPG = liquefied petroleum gas.

Source: Author calculations using IMB (2015).

The decline in piracy, however, is not universal. Piracy incidents in Southeast Asia and South Asia are either rising or continuing unabated (Figure 2-3). The declining trend in attacks on vessels has been led by greater maritime security off the Horn of Africa, which in this data set includes the Gulf of Aden, the Arabian Sea, and all countries on Africa’s eastern coast between Egypt and Mozambique.

⁵ IMB uses the UNCLOS and IMO definitions of piracy and armed robbery.

Figure 2-3. Number of Vessels Attacked, by Region



Note: 1) 2015 data has been estimated using actual January–September data of 2015. 2) *Horn of Africa here includes Gulf of Aden, Arabian Sea and all countries on Africa’s eastern coast, from Egypt to Mozambique.

Source: Author calculations using (IMB, 2015), (IMB, 2015).

Many of the victim ships are managed or controlled by Asian and European countries. Table 2-1 lists the top 15 countries impacted by piracy and robbery in 2014. (Note that this does not reveal the direction of trade, only the ownership of vessels).

**Table 2-1. Countries Where Victim Ships Controlled/Managed
January–December 2014**

Country	No. of Ships	Country	No. of Ships
Singapore	63	Denmark	8
Greece	30	Netherlands	8
Germany	15	Italy	7
Hong Kong	13	Japan	7
India	13	Norway	7
United Kingdom	13	Thailand	6
Malaysia	11	China	5
Denmark	8	South Korea	4

Source: IMB (2015).

Of the 245 ships attacked in 2014, 14 percent of them were either hijacked or fired on. In all, 442 crew members were held hostage. Between 2010 and 2014, 27 crew members were killed, 141 were injured and 108 kidnapped or held for ransom.

Oceans Beyond Piracy (OBP) (a project under the One Earth Future Foundation) in its ‘State of Maritime Piracy’ Report (OBP, 2015) uses a broader definition of piracy and compiles data from a host of sources including the counter piracy naval operations, datasets from IMB, International Maritime Organization, United States Maritime Liaison Office Weekly, National Geospatial-Intelligence Agency, Regional Cooperation Agreement on Combating Piracy and Armed Robbery against Ships in Asia (ReCAAP), OceanusLive, other private sources, and reporting from the media. It estimates that in all, 3654 crew members were attacked

(successful and unsuccessful incidents) in Southeast Asia, 320 in Western Indian Ocean, and 1035 in the Gulf of Guinea in 2014. Importantly, OBP estimates that piracy led to economic losses of \$2.3 billion in the Western Indian Ocean and \$983 million in the Gulf of Guinea⁶.

While socio-economic causes and piracy trends differ from region to region, weaknesses in legal frameworks have had a role to play in the lack of resolute and effective action globally. Definitional issues as well as the lack of ratification of the Montego Bay Convention (1982) and the Rome Convention (1988) both contribute to the legal shortcomings. The Montego Bay Convention defines piracy by including only those acts carried out on the high seas and only those that have a 'personal motivation' (as opposed to a political one). Importantly, if there was a chase that began on the high seas, it is supposed to end when the target vessel enters the territorial water of one state, unless the agency has authorisation to conduct the chase. Pirates have liberally exploited this loophole. While the Rome Convention later expanded the definition, however, limitations have remained, for instance in the form of inadequate description of violence and the exclusion of mutinies as acts of piracy. These issues have been discussed in depth in (IRASEC, 2008).

Definitional inconsistencies and inadequacies have impacted data collection and therefore analysis. Language barriers and changing reporting requirements by various agencies too have led to the exclusion of certain acts of piracy in the datasets. Nonetheless, the dynamics of piracy in Southeast Asia and the Western Indian Ocean are discussed below.

2.2.1.1. Southeast Asia

Piracy in Southeast Asia has been a perennial problem, enabled by both the region's unique geography and socio-economic and political problems. IMB data reveals that piracy has been rising since 2008, after a sharp fall starting 2000. Prior to that piracy had steadily increased in the 1990s, and had spiked after 1997.

Oceans Beyond Piracy (2015) reports that in 2014, 3654 crew members were attacked and 800 of them were subjected to or threatened with violence. A total of 289 were held hostage and 5 were killed. Of all the crew members exposed to piracy in this region, nearly 30 percent were from Philippines, 28 percent from India, and 11 percent from India⁷.

The area of interest in Southeast Asia is nearly as large as the high-risk area (HRA) in the Indian Ocean (as described in section 2.2.1.2), however, piracy in the HRA takes place in international waters, unlike Southeast Asia, where piracy incidents take place in territorial and archipelagic waters, and the exclusive economic zones (EEZ) of the countries in the region. The region's unique geography – scattered with small islands, narrow waterways, small islets, riverine access and narrow straits – provides a conducive environment for pirates to operate in robbery at sea within the EEZ.

⁶ Economic losses in Southeast Asia were not calculated.

⁷ So far, there has been no analysis of the economic costs of piracy in Southeast Asia that could be comparable to the analysis carried out in the case of Somalian piracy.

Data from the Information Sharing Centre (ISC) of the ReCAAP (2015) reveal that in 2015, 93 incidents occurred in the Straits of Malacca and Singapore, 10 in the South China Sea, 2 each off the coasts of Philippines and Malaysia, and 1 incident off Indonesia. These incidents constituted 60 percent of the nearly 200 incidents in Southeast Asia, the rest of which occurred while vessels were at ports and anchorages. Indonesia and Viet Nam were major spots of in-port incidents. Most cases, however, are instances of petty theft rather than high profile hijackings that characterised piracy in the Western Indian Ocean.

Figure 2-4. Trade Routes in Southeast Asia

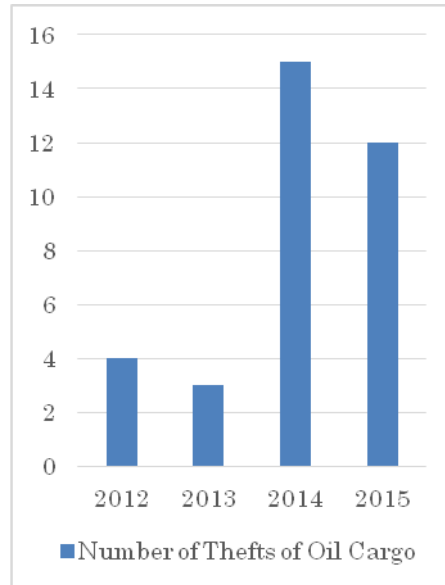


Source: Author.

In 2015, there were 12 incidents involving hijackings of vessels carrying oil cargoes. Six of these were in the South China Sea, four in the Malacca Strait, and one each in Indonesia and Malaysia. Figure 2-4 displays a map with the major trade routes in Southeast Asia.

Overall, thefts of oil cargo in the region have increased since 2013 (Figure 2-5). Examples of incidents include MT Jaoquim whose load of light crude oil (LCO) was 'stolen' in August 2014 (Jakarta Post, 2015), and in July 2015, MT Orkim Harmony carrying 6000 MT of gasoline valued at \$7.5 million was attacked by pirates (the pirates were eventually arrested) (Nikkei, 2015) (Jakarta Post, 2015). In many cases, the modus operandi has been to siphon the oil cargo sell in the underground markets, to destroy the communication and navigation equipment, and to thieve the personal belongings of the crew. However, violence was not reported in most cases (ReCAAP, 2015).

Figure 2-5. Number of Thefts of Oil Cargo in Southeast Asia



Source: ReCAAP (2015).

An analysis of the causes of the rise in piracy starting in the 1990s and then the decline starting in the 2000s provides a good template to understand the dynamics of the problem in this region. Security practitioners and commentators in the region interviewed by Storey (2008) reasoned that the socio-economic distress on the islands of Sumatra and Riau linked to the Asian financial crisis as the primary cause of increased piracy attacks starting in the 1990s. The crisis began in Thailand in 1997 and soon after spread to Indonesia, leading to a spike in unemployment from 4.7 percent to 21 percent in 1998 in one year. In the same year, defence spending fell by 17 percent, which ultimately led to only 30 percent of the Indonesian navy's vessels being operational.

Elsewhere, the Sulu Archipelago in the Philippines had become a hub of illegal maritime activities including smuggling, trafficking, and piracy in the 1990s. Other regions in Southeast Asia also became mired in poor socio-economic conditions, poor governance, weak political control and the lack of state capacity. There were even instances of corrupt government officials passing on information of vessel movements to pirate gangs in advance.

As pirate attacks increased in the 1990s, Southeast Asian states increased engagement with each other to control this problem. Initial efforts, however, did not have the desired effect as they were 'poorly implemented, largely ineffective, and became moribund during the Asian financial crisis', according to Storey (2008). In the 2000s, new efforts were launched, including the Regional Maritime Security Initiative (RMSI) and the ReCAAP. However, due to concerns over sovereignty and competing priorities of member states, these efforts led to controversy. In the fallout of such controversy, Malaysia, Singapore, and Indonesia began conducting coordinated patrols in the waters in 2004. This was followed by an initiative called Eyes in the Sky in 2005, which involved maritime patrol aircraft conducting two sorties every week over the Malacca and Singapore Straits. Together, these patrols were known as

the Malacca Strait patrols. Cooperation between countries was facilitated by ASEAN, even as it practiced a policy of 'non-intervention' in the domestic affairs of member nations.

Further, Singapore required all vessels in its territorial waters to carry identification transponders, and the Singapore Navy deployed armed security teams. The Government of Malaysia also deployed armed guards to conduct search and security operations. Separately, Indonesia also conducted comprehensive exercises using warships, helicopters, aircraft, and special forces. Importantly, action was also taken on land. These efforts paid off, with piracy falling to a decade low in 2008.

However, piracy in the region could not be maintained to these levels for long, with the numbers spiking thereon. Even as the efforts succeeded initially, there were a few weaknesses. Firstly, the Malaysia Strait patrols were coordinated patrols, not joint patrols. That is, every country was responsible for patrolling its own waters, rather than the navies jointly patrolling the entire region. This would particularly be a problem when it came to 'hot pursuit' into the territorial waters of a different country. Secondly, the patrol aircrafts were not equipped with night vision equipment and the patrols were too few to cover the entire region. There was also a fear of 'patrol fatigue', whereby participating countries would lower their guard over time, and a lack of coordinated patrols particularly in the tri-border area (Storey, 2008). Further, some countries in the region, such as Indonesia, had multiple agencies in charge of security at sea, which impacted coordinated action (ARC, 2007).

The use of private security guards in this region has been starkly different from the western Indian Ocean owing in part due to the attitudes of governments, as vessel movements in this region is often in territorial waters. Indonesia has spoken out against the use of armed private guards on ships because, inter alia, there is an absence of international regulation in this domain (Jakarta Post, 2012). On the other hand, while Singapore does not ban the use of private guards on ships, it does not consider it an alternative to the employment of best management practices. It considers the use of private security as the last resort, after a thorough risk assessment by private operators (Dutton, 2013). Several private security companies, however, have been operating in the region, the oldest of which started operations in 1946.

The resurgence of piracy in the Southeast Asian region has been made possible owing to the high volume of traffic in the region (120,000 vessels annually through the Strait of Malacca alone) and the strengthening of pirate gangs. Further, poverty, which is a background condition that enables piracy, remains in place. Illegal fishing by foreign vessels in the territorial waters of the littoral states too has played an enabling role in the lawlessness at sea and economic distress of local communities (Roughneen, 2015). Importantly, the underground market for light fuel oil (marine gas oil) continues to be highly profitable in this region (Baird Maritime, 2014).

While international cooperation has focused on securing SLOCs, piracy and armed robbery in territorial waters lack similar cooperation as operations have been traditionally rather than jointly coordinated.

To counter the resurgence of piracy in the Southeast Asian region, the littoral states have begun stepping up security exercises. For instance, the navies of ASEAN member countries joined forces to hold joint operations in 2015 in the Malacca Strait (Jakarta Post, 2015). Malaysia and Indonesia particularly have taken robust action by targeting organised pirate gangs through their rapid response teams (Reuters, 2015). The arrest and prosecution of two gangs – the MT Sun Birdie gang and the MT Orkim Harmony hijackers in 2015 – were a key achievement. Indonesia and Australia have also formed a regional partnership to combat piracy, which includes capacity building through the ‘Jakarta Centre for Law Enforcement Cooperation’ (TME, 2015). Additionally, action against illegal fishing has been undertaken, including the destruction of illegal and foreign fishing vessels (Roughneen, 2015). However, the IMB warned against complacency as piracy remains high in frequency (IMB, 2015).

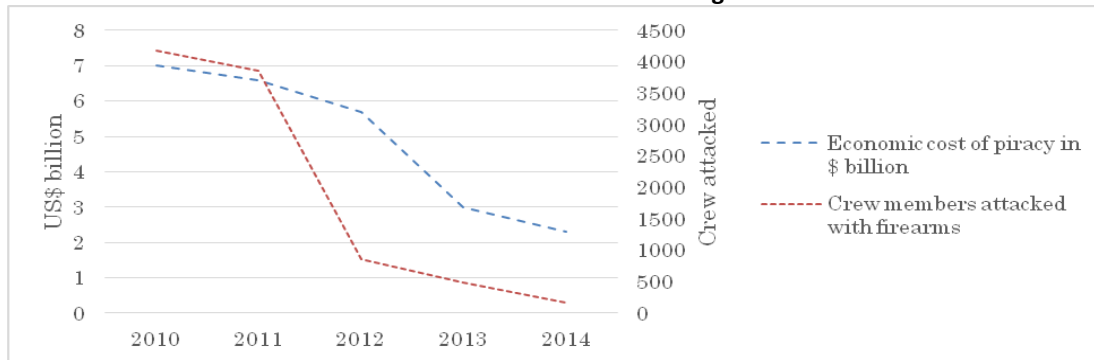
2.2.1.2. Western Indian Ocean

While the Western Indian Ocean itself is not on the path of the oil and LNG vessels that are headed towards Asian countries, it is worth considering the region in this analysis of Asia’s energy security. This is because, firstly, at the height of piracy off Somalia’s coasts in 2009–2010, there were attacks deep into the Arabian Sea, which did come in the path of trade from the Middle East to Asia. This is relevant because even though piracy in the Western Indian Ocean has now been curbed, the background conditions are still in place (discussed below), due to which the risk of piracy re-emerging remains. Secondly, an HRA has been announced by market associations in this region (discussed below, Figure 2-7), which has raised insurance premium for vessels passing this region. This has an impact on trade between the Middle East and Asia.

IMB data indicate that piracy in the Western Indian Ocean region originates primarily from Somalia. Piracy in this region has gained infamous proportions over the past several years due to high profile hijackings, large payoffs to pirates and counter piracy activities by the world navies. Over the last few years, however, IMB and other reports show a decline in piracy in this region. For instance, 139 attacks were reported to IMB off the coast of Somalia and 53 in the Gulf of Aden in 2010. This number dropped to three and four in 2014, respectively. Overall in the entire Western Indian Ocean region, Oceans Beyond Piracy recorded 18 attacks. However, there were no hijacks of commercial vehicles.

Further, the economic losses of \$2.3 billion estimated by Oceans Beyond Piracy includes costs imposed due to the employment of armed guards, security equipment, increased speed of travel, rerouting (both through the Cape of Good Hope and within the Indian Ocean region), insurance costs, military operations, ransoms and associated payments, prosecutions and imprisonment and counter-piracy operations. These economic costs have fallen over the years with a fall in the number of vehicles attacked (Figure 2-6). The figure also shows that attacks on crew members have fallen since 2010.

Figure 2-6 Economic Costs and Number of Crew Members Attacked in the Western Indian Ocean Region



Source: OBP (2015).

However, this should not lead to the conclusion that piracy in this region will remain under control in the future, as the background conditions that have enabled piracy continue to exist. The background conditions are threefold: firstly, the socio-economic conditions in Somalia; secondly, the lack of state capacity and division between states; and thirdly, the presence of illegal fishing off the coast of the country.

Life expectancy in Somalia stood at 55.4 years in 2015. The Human Development Index report points out that underdevelopment and poverty in the country has led to a feeling of ‘exclusion’ and ‘frustration’ among the youth. Multidimensional poverty in Somalia affects 60 percent of the urban and 95 percent of the rural population. Unemployment estimates are at 47.8 percent of the population over 25 years of age (UNDP, 2015). Per capita income in Somalia was \$600 (PPP) in 2014, ranking it 197 out of 198 countries (CIA, 2014).

Somalia’s poor socio-economic indicators continue to remain depressed in part owing to the lack of a stable government. In fact, the country has not had a permanent centralised government since 1991, when the military regime of President Said Barre was overthrown. Although it has had a federal government based in Mogadishu since 2012, it is weak and is in conflict with the regional governments of Puntland in the northeast and Somaliland in the northwest.

The regional governments of Puntland (which was declared an autonomous state in 1998), and Somaliland (which declared independence in 1991) operate with varying degrees of independence and effectiveness (Seyle, 2015). Somaliland particularly is nearly fully autonomous and has sought recognition as an independent state, but the state is weak and several areas in the region are dominated by non-state militias. Further, these two regional governments too are at loggerheads, with risks of military conflict between the two (Balthasar, 2014).

Such conflict in the region has ensured that the capability and coordination needed to fight maritime crime such as piracy and illegal fishing has remained wanting. In fact, Somali piracy itself may have its roots in illegal, unreported and unregulated (IUU) fishing in the region, as

claimed by several quarters including Hassan Sheikh Mohamud, the President of Somalia (Mohamud, 2015). The argument is that in the absence of state capacity to provide security, Somali fishermen independently took up arms to protect their waters in the face of IUU fishing that had its origins in various countries. After success against foreign IUU fishing vessels, these armed Somali fishermen shifted their focus towards cargo ships and oil tankers, giving rise to piracy as we know it.

Piracy in this region reached its peak in 2011, when around 50 pirate bands operated comprising 2,000–3,000 pirates from six known bases in Somalia. By this year, Somali pirates had spread from just off the coast of the Horn of Africa to deep into the Arabian Sea and other distant waters. Pirate earnings stood at \$238 million, with the average ransom at \$5.4 million in 2010, up from \$150,000 in 2005. Crude oil tankers particularly became vulnerable to attacks. Major instances of hijackings include Korea's MV Samho Dream in 2010, carrying 2 million barrels (mbls) of oil, which was released upon a payment of \$9.5 million. An even larger payout took place in the case of Greece's MV Irene SL in 2011, which was also carrying 2 mbls of crude oil. The ransom amount for this vessel was \$13.5 million.

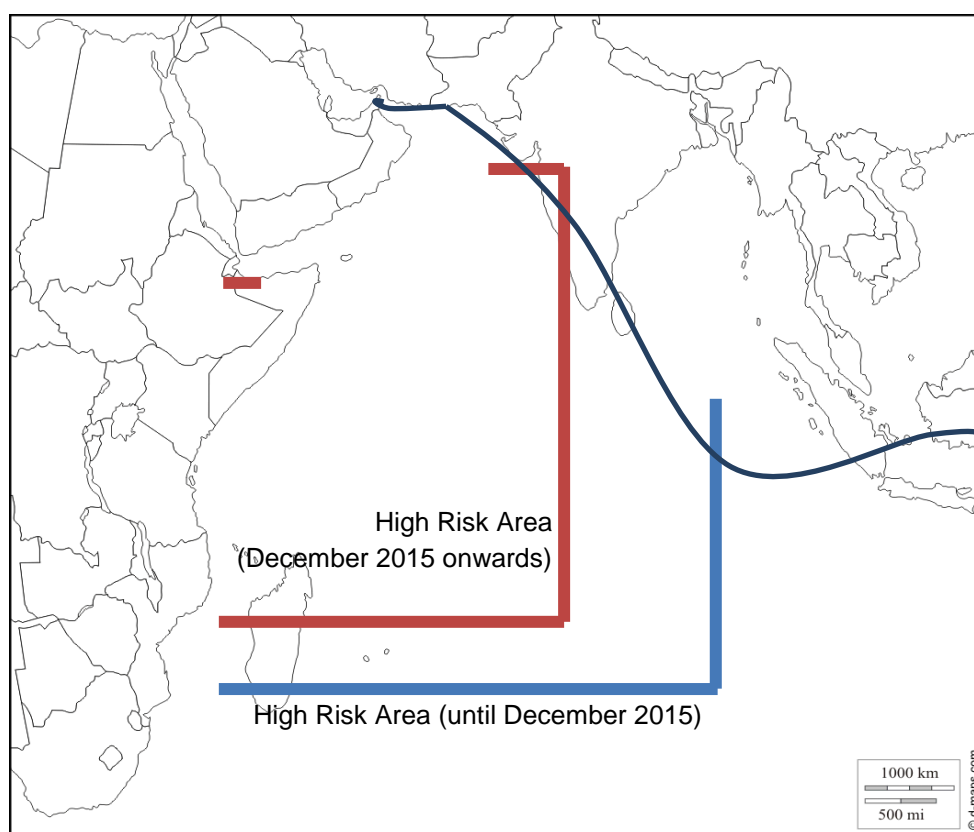
To deal with piracy, the shipping industry along with the United Kingdom Marine Trade Operations, European Union (EU) NAVFOR, and other organisations formulated the Best Management Practices for Protection against Somalia Based Piracy (BMP). The BMP (the latest version being BMP4) includes tactics such as speeding up in pirate-infested zones, better coordination and vigilance, use of water cannons⁸ to prevent the boarding of pirates, among others (BMP4, 2011). The United Kingdom Marine Trade Operations and the EU Chair of the Contact Group of Piracy off the Coast of Somalia also announced a high-risk area (HRA), which is an area that has a high risk of piracy and therefore BMP4 must be put into force (PIB, 2015). Further, the Joint War Committee of London-based Lloyd's Market Association has delineated a war-risk area (WRA) to include regions with risks of piracy, terrorism, and war (Figure 2-7) (OBP, 2015).

Over the years, piracy in the HRA/WRA has fallen not only due to the deployment of the BMP, but also due to coordinated naval action by several countries. Major operations and naval missions include Operation Atlanta, an EU deployment (EU NAVFOR), which was originally put in place to protect United Nations World Food Programme vessels to Somalia; a North Atlantic Treaty Organization (NATO) deployment; and the Combined Task Force 151, which is a US-led mission consisting of 25 countries. Apart from this, countries including India, Japan, China, Russia, Saudi Arabia and Iran have conducted maritime security operations in the area. The missions include visit, board, search and seizure operations, and escorting high value and vulnerable ships in the region (CSIS, 2011). For instance, the Government of India revealed that it had deployed 52 naval ships in the HRA, which escorted over 3,100 merchant ships carrying over 23,000 Indian crew safely (PIB, 2015).

⁸ As per international law, civilian vessels are not permitted to carry guns on board.

Apart from the BMP and naval activity, piracy in this region has seen a proliferation of private security companies that offer, inter alia, armed escorts and on-board presence of guards to merchant ships in the HRA. The number of registered maritime private security companies has risen from 56 in 2010 to over 400 in 2014. This has proven to be expensive to merchants, as armed escorts can cost up to \$50,000 for a three-day transit through the Gulf of Aden (CSIS, 2011). Further, in 2013, 35–40 percent of the over 65,900 merchant vessels that transited through the HRA had private armed guards on board.

Figure 2-7. High-Risk Area in the Western Indian Ocean



Source: OBP (2015).

While some merchants may find private security necessary, there is a risk of untrained and overzealous guards killing pirates and even innocent civilians indiscriminately. Some accounts suggest that this may already be happening (Dutton, 2013). There also is an element of uncertainty for private security companies when they enter the territorial waters of other countries, as is illustrated by the sentencing of 35 private security guards by an Indian court for illegally entering Indian waters carrying weapons aboard a US-based anti-piracy vessel in 2016 (Strait Times, 2016).

Yet another private security measure has been the establishment of floating armouries, which are vessels that provide services for PSCs including the embarkation and disembarkation of PSC personnel, and storage of arms and equipment. About 30 floating armouries were in operation in the Red Sea and the Gulf of Aden in 2014, with an average of 1,000 firearms and other ammunition on board (GIG, 2015).

Of course, not all the efforts against piracy have been at sea: action against pirate bases on land have had a large impact. The Puntland Maritime Police Force particularly helped dismantle pirate bases on Puntland's coast. However, this force has come into criticism for its murky private financing, lack of regulation and links of its members with local militias (Mazzetti and Schmitt, 2012).

Owing to the multi-fold effort against piracy, i.e. the implementation of the BMP, coordinated naval operations, on ground action, and private security guards, Somali piracy in the Western Indian Ocean was brought to check after it hit a peak in 2010. However, such action has come at an economic cost due to several factors including increased speeds (as suggested by the BMP), military costs, and the amounts paid to private security agencies. None the less, the root causes that led to piracy in the first place – i.e. poverty and the lack of opportunity in Somalia, and illegal fishing off the coasts of the country – have not yet been addressed.

Somali President Mohamud (2015) points out that foreign bottom trawlers have fished 'recklessly and acted with impunity, dragging heavy nets, razing the bottom of our seafloor and damaging an astounding 120,000 square kilometres of important marine habitat'. In spite of the Somali Fisheries Law that outlaws bottom trawling in its 200 nautical miles EEZ, there is evidence that foreign fishing vessels have returned to its waters. Secure Fisheries, a programme of the One Earth Future Foundation, reveals that foreign IUU fishing extracts three times more fish than Somalis from Somalia's EEZ, the value of which is nearly five times more. Between 1981 and 2013, foreign IUU fishing has increased 20 times, with a majority of such vessels from Iran, Yemen, Spain, Egypt, and France. In fact, even as Somali piracy was brought into check after 2010, IUU continues to remain high (Secure Fisheries, 2015). Reports from 2015 point at protests in Somalia against foreign fishing trawlers, with locals being quoted as saying they would resume piracy if they could not earn. Puntland's President Abdiweli Ali Gaas also stated that the 'highway robbery' of foreign fishing trawlers 'may rekindle piracy' (BBC, 2015).

2.2.2. Terrorism and regional conflict

While piracy and terrorism are linked in various ways, unlike terrorism, the dynamics of piracy largely work in a maritime environment, which make solutions in the maritime space possible. The BMP and private security are examples of solutions in this space, even though the solutions of the 'root cause' in the form of poverty of coastal communities remain an on-shore issue. The dynamics of terrorism, however, are almost entirely based on shore, with maritime trade being only one potential theatre of conflict.

Intelligence reports point to risks of attacks on oil and LNG tankers (discussed below) that could have an impact on the economy of any region. Such an attack would be technically very challenging to execute, and there have been no precedents. However, a 'Black Swan' event, i.e. an event with a low likelihood of occurrence but one that would have a large impact, could have serious ramifications on maritime trade and even the global economy at large. The need for security agencies to remain vigilant remains of utmost importance.

Some security measures in the maritime space, however, have been taken in the wake of heightened fears of major maritime terrorist attacks. One key measure has been the implementation of the International Ship and Port Facility Security (ISPS) Code. The objectives of this code are to establish an international framework involving co-operation between government agencies, ensure collection and sharing of information, better coordination, provision of a methodology of security assessment, and to ensure that adequate and proportionate maritime security measures are in place. The code lays down plans for the security of ships, crew, equipment as well as ports (ISPS, 2004). Apart from the ISPS, there are port security protocols including the Container Security Initiative and Customs Trade Partnership against Terrorism, both efforts by the US. However, even as such initiatives are necessary, terrorist attacks at sea can still take place, as will be illustrated below.

In addition to the risk of attacks by militants, there is a related risk of regional conflict impacting trade in sea lanes. The Strait of Hormuz, in particular, has presented this risk. While the conventional blockades may not be possible for a variety of reasons, there exists a risk posed from unconventional sources. The dynamics of terrorism and conflict are discussed below.

2.2.2.1. Southeast Asia

There have been concerns over the links between piracy and terrorism in the Southeast Asian region, particularly in the Strait of Malacca and the tri-border sea area. Groups that have been involved in maritime terrorism include the Abu Sayyaf Group in the Philippines, which in 2004 sank the MV Super Ferry killing 116 people and injuring more than 300 (Storey, 2008). Yet another Filipino group that has a history of maritime violence is the Moro Islamic Liberation Front. In Indonesia, the Free Aceh Movement has also been linked with maritime political violence, although it has never been involved in attacks with mass casualties. The lack of empirical data due to definitional issues of maritime violence and language barriers make analysis of trends challenging.

Various intelligence and security agencies have also intercepted and arrested members of groups planning large attacks. For instance, in December 2001, Singaporean agencies arrested members of the Jemaah Islamiyah, who had been planning attacks on US naval vessels using high-speed boats packed with explosives. Similar intercepts were made of Indonesian and Malaysian terrorist groups in 2001. Other intercepts by Britain's Royal Navy revealed in 2004 that targets were not only naval ships, but also commercial vessels. The plots, some of which were linked to al-Qaeda, involved attacks on the Strait of Malacca to

disrupt trade. Yet another intercept by the United States revealed al-Qaeda's plans for using a 'floating bomb' in the region after hijacking a vessel (Storey, 2008).

Further, owing in part due to the differences in motivations and root causes of piracy and terrorism, there exist only a weak link between the two. There have been contrasting voices on the threats from the links between piracy and terror groups. While Singapore has flagged this concern in the past, Malaysia has claimed it has not found any link between the two (AP, 2005). Even though evidence of such links may not be apparent, the background conditions of the lack of economic opportunity, political disenchantment and exclusion can lead to such links strengthening over time, especially in the form of illegal arms trade, and armed pirate gangs evolving to take political stances, among others.

Because of such perceived risks of maritime terror attacks in the 2000s, combined with the incidence of piracy and armed robbery in the region, London based Lloyd's Market Association declared a 'War Risk Area' in much of Southeast Asia in 2005, which resulted in higher insurance premiums on vessels passing through the Strait of Malacca. The potential impact this listing could have had on trade in the region encouraged regional economies to take additional measures to address piracy, armed robbery and terrorism in the region (Ong, 2014). Eventually, the listing was removed in 2006 after some lobbying, although some areas in Indonesia continued to attract higher premiums.

2.2.2.2. Persian Gulf

The Persian Gulf has experienced war and conflict in the past few decades, including the Gulf Wars of 1980–1988 and 1991, and hostilities among the Arab states and Iran continue to play out in various forms today. There also is a presence of naval forces from the United States, United Kingdom and France in this region. At its narrowest point at the Strait of Hormuz, the entire channel falls either in the territorial waters of Oman in the south or Iran in the north.

Hostilities in the region have relevance to the energy markets as 20 percent of the overall oil exports globally come from this region, constituting nearly 35 percent of all exports by sea. The region has over 26 oil terminals. The risk of conventional wars and blockades, however, is low, as the Arab countries and Iran too depend on the channel for their exports and therefore have an interest in ensuring free movement. However, skirmishes between the navies in the region and the use of unconventional tactics and forces pose a risk to not just physical supplies, but also raise insurance premiums and influence oil prices.

Disputes and rivalries in the region emanate from several factors and play out in various realms. One such rivalry is between Iran and the Arab states in the region. Ever since a revolutionary government took over in Iran in 1979, there have been allegations by the Arab states of the Iranian regime promoting revolution in their countries. In 1980, Iraq under Saddam Hussein invaded Iran, which was supported by the Arab states. Owing to a lack of conventional military capabilities, Iran deployed unconventional tactics, including attacks on oil tankers and other energy infrastructure. In all, 168 vessels were attacked by Iran between 1981 and 1987. The lack of conventional capabilities has its roots in the suspension

of arms trade from the United States since the 1979 revolution. The targeting of tankers was an indirect assault on the 'financial backers of Iraqi forces' (CSIS, 2014) and a means of power projection in the face of international sanctions.

Further, there is an ongoing dispute over three islands between Iran and the United Arab Emirates, namely Abu Musa and the Greater and Lesser Tunbs, on the west of the Strait of Hormuz. The dispute began when British forces withdrew from the islands in 1971, which was followed by Iran taking control of these islands. Hostilities over these disputed islands continue to this day, as Iran has converted the islands to military sites, home to the Iran Revolutionary Guard Corps Army and Navy, apart from weaponry (IBT, 2012).

Yet another source of friction has been the signing of the nuclear deal after 12 years of negotiations between Iran and the P5+1 nations of United States, the United Kingdom, France, Russia, China and Germany. In Iran, the military and hard-line politicians had been lobbying for a nuclear weapons programme in Iran until the Supreme Leader Ayatollah Khamenei reiterated a fatwa banning nuclear weapons (Rocard, 2014). After years of hard negotiations, changing internal politics and geopolitics, a comprehensive deal was signed that will lift sanctions on Iran in exchange for cooperation that would limit Iran's development of its nuclear programme (Perthes, 2015). However, Arab states in the region have expressed disapproval of this deal. This deal, while arguably necessary, presents the risk of escalating tensions between the regional players.

Further, there is also an ongoing dispute between Iran and the United States over applicable laws of the sea. The US, Iran and Oman have different interpretations of international law regarding maritime claims and applicable navigation regime in the Strait of Hormuz. The UN Convention on the Law of the Sea (UNCLOS) allows coastal states to draw straight baselines along its coastline to claim 12 nautical miles of territorial seas. As the inbound channel is to the north of the outbound channel, every ship entering the Persian Gulf must at some point pass through Iranian territorial seas. UNCLOS has been in place since 1994, and has been ratified by Oman but not by Iran (although Iran is a signatory). The United States is the only maritime power that is not a party to the convention, citing which Iran has declared that countries that are not a party to the convention cannot avail themselves of transit passage in the strait⁹. On the other hand, the United States does not recognise the full extent of Iran's claimed territorial sea in the strait. It also does not recognise Iran's claim on Abu Musa and the Greater and Lesser Tunbs. Differences over the laws of the sea have led to skirmishes between Iran and the United States at sea (Valencia, 2015).

However, despite such differences and incidents, the Strait of Hormuz has largely remained immune to the wars and rivalries in the region. What it has had an impact on are insurance premiums and international oil prices (The Economist, 2015).

Next, in the region at large, there happen to be areas in control of militant groups such as the Islamic State in Syria and Iraq, and the Tehrik-i-Taliban Pakistan, and Jaish-e-Mohammad

⁹ Warships belonging to the United States, however, only pass through Omani waters, according to Ivey (Ivey, 2015), a Lieutenant Commander in the United States Navy.

in Pakistan. These groups have carried out attacks entirely on land, but the risk of maritime attacks exists, in case their spheres of influence grow in the future. There already exist precedents of attacks at sea. For instance, in 2010, an al-Qaeda linked group attacked M Star, a Japanese oil super tanker, as it approached the Strait of Hormuz. The ship was carrying about half of Japan's daily need of oil. Fortunately, the explosion at the ship's hull did not lead to a leak of the oil (The Guardian, 2010).

In sum, while risks of conventional blockades and attacks on the Strait of Hormuz are low owing to the reliance of regional players on this strait for their own trade, risks of unconventional warfare remain. Additionally, states must be vigilant of terrorist attacks at sea.

2.2.2.3. Western Indian Ocean

In Yemen, there is an ongoing civil war, compounded by a military intervention led by Saudi Arabia. In March 2015, Houthis, a Zaidi Shia group that is dominant in the northern highlands of Yemen, overthrew the government in capital Sana'a. They began advancing south towards the Gulf of Aden, when a Saudi-led coalition launched air strikes to support pro-government forces in Yemen. Saudi Arabia has concerns over Iranian involvement in the Yemeni conflict, as it believes Iran is assisting the Houthis.

It thus created a coalition of Sunni-majority Arab countries including Egypt, Jordan, Morocco, Qatar, Sudan, and the United Arab Emirates to counter the Houthis. The United States has conducted air raids, provided logistical and intelligence support to this coalition. Amid this conflict, al-Qaeda in the Arabian Peninsula has taken advantage of the disarray and occupied territory in Yemen. The conflict has also led to a humanitarian crisis, with internal displacement of people and the collapse of health and education (CFR, 2015).

Further, as discussed in Section 2.2.1.2, there is division within Somalia, apart from a lack of state capacity to deal with security threats comprehensively. Together, internal conflict in Yemen and the lack of state capacity in Somalia are being exploited by militant groups, in particular by Al Shabaab, which is a Somalia-based al-Qaeda affiliate. While the organisation has primarily operated on land, there are concerns over its operations in the maritime space and their engagement with pirates. For instance, a World Bank study stated that a part of the \$385 million ransom money that Somali pirates extracted between 2005 and 2012 was used to finance militant groups including Al Shabaab (Roughneen, 2015). While the motivations of pirates and militant groups may differ, they use the same shortcomings and there is a risk of pirate groups evolving a political agenda.

The United States has conducted air strikes in Somalia against Al Shabaab, and these strikes increased in tempo in 2015. In all, the United States has invested over US\$1.5 billion in building capacity of Somalia and African Union to enable them to provide security in their backyards. Further, neighbouring countries such as Ethiopia and Kenya have also played important roles in ground offensives and air strikes (CRS, 2016).

The risk of attacks on oil and LNG vessels in the Gulf of Aden and the western Indian Ocean in general is thus very real. Indeed, there happens to be a precedent of a major attack on a

vessel, as al-Qaeda had bombed USS Cole in the Yemeni port of Aden in 2000. More relevant to energy trade was an attack in 2002 on Limburg, a French oil tanker, using an explosive-laden boat. The explosion led to the death of one crew member and sent more than 90,000 barrels of oil pouring into the Gulf of Aden (BBC, 2002).

The conflicts and political instability on both shores of the Gulf of Aden is structural and rooted deep in historical events. The influence of militant groups has not waned, and state capacity to deal with them remains wanting. Human development indicators too remain depressed. While piracy in this region has fallen owing to increased naval presence and other measures, illegal activities at sea (such as fishing) continue unabated. For these reasons, a moderate risk of an attack on oil and LNG vessels exists.

2.2.3. Congestion and accidents

Congestion at sea can lead to delays and impose costs on companies. As of April, 2016, 200 million barrels of crude was waiting to be loaded or delivered. This has resulted in queues of super tankers on the world's busiest sea lanes. Ship tracking data reveal that 125 super tankers are waiting in line at ports, the combined cost of which is \$6.25 million per day (Reuters, 2016).

A related aspect of maritime trade is accidents at sea, which in turn can lead to congestion and delays. For instance, in 2014, two container ships collided at the northern end of the Suez Canal, leading to severe interruptions and delays (Reuters, 2014). A similar incident occurred in 2015, when a Danish flagged ship and Liberian flagged ship collided in the Suez Canal in dense mist, which ended up delaying traffic for several hours (Business Insider, 2015).

The risk of congestion and accidents relevant to Asian energy imports is discussed below.

2.2.3.1 Strait of Malacca

The Straits of Malacca and Singapore are the second busiest in the world after Dover Strait in Europe. Being much wider than the Suez Canal, the Malacca and Singapore Straits accommodate six times the volumes of the navigational traffic compared to the Suez Canal. In deadweight tonnage terms, tankers have the largest shares among vessels transiting these straits.

The volume of traffic in these straits has been consistently rising over the years, which poses the risk of delays due to congestion, especially in the event of an accident or a resulting oil spill. In such a situation, a few vessels may have to divert to the Sunda, Lombok, or Makassar Straits, the routes of which are longer. Such detours could extend the navigation distance by up to 1,000 nautical miles. This implies an additional shipping cost of US\$500,000 per ship per transit for a large vessel like a very large crude carrier (VLCC) (Sakamoto, 2008).

Between 1978 and 2003, 888 accidents were reported to have occurred in the Straits of Malacca and Singapore (Basiron and Hooi, 2007). From 2001 to 2007, 236 maritime casualties took place in the Straits of Malacca and Singapore. Most of these accidents involved collisions and explosions.

Such accidents have may lead to oil spills. To take an illustration, in August 2009, an oil tanker carrying 58,000 tons of naphtha oil collided with a bulk carrier in the Malacca Strait. This caused a massive explosion and fire resulting in nine casualties and an oil spill [The Nippon Foundation, 2009; Earth Times, 2009]. Yet another major collision took place in 1997 between MT Evoikos and MT Orapin Global in the Strait of Singapore. Transporting approximately 130,000 tonnes of heavy fuel oil, MY Evoikos created sustained damage to its three cargo tanks and spilled an estimated 29,000 tonnes of fuel into the sea. The cleaning up cost of this oil spill was approximately US\$7,500,000, and it took 3 weeks to clean up.

However, the risk of individual instances of collisions blocking the straits even at some of the narrowest points on the straits is low. None the less, a few choke points along the navigation channel in the Singapore Strait are exposed to impacts from explosion hazards and toxic releases in case they happen. Accidents can hamper the petroleum and bulk traffic impacting countries that are dependent on these straits for their trade.

Accidents can also lead to vapour cloud explosions that can impact vessel crews and civilians in residential areas, requiring emergency evacuation measures. Losses could also be borne by businesses due to lost production time, emergency shutdown and process upsets due to workers' need to take protective action. These could result in high liabilities for businesses. Moreover, local governments and responders can face health risks, which could impact public risk perception and risk tolerance, resulting in possible changes in regulations.

However, the likelihood of any of the above events occurring is still relatively low, as safety and mitigation measures in the industry do exist. Moreover, several policy measures have been taken in the past to mitigate accident risks in sea lanes. In particular, regional search and rescue exercises (SAREX) have been carried out in the ASEAN countries, the first of which was in 2001. Other SAREX exercises have been conducted periodically by countries in the region.

2.2.3.2 Panama Canal

The waiting time to enter the Panama Canal from the Pacific side has averaged 26 hours since 2011, while it has averaged 16 hours from the Atlantic side (Commodity Flow, 2015). At times, however, wait times can be high, as they were in October 2015, when ships had to wait over 10 days to transit the canal (ICIS, 2015). While average tonnage of ships since 2011 has not increased, the waiting time has built up, in part due to delays associated with canal expansion activity. Ongoing canal expansion activity will enable a new class of container vessel to navigate the canal, which could be twice as large as the existing vessels capable of transiting the canal. The largest ships that can navigate the canal are known as Panamax vessels, while after the expansion, the maximum size would be the referred to as the 'New Panamax' vessels. Currently, over 14,000 Panamax ships transit the canal each year (Mitchell, 2011). While canal expansion activities are ongoing, during periods of peak traffic, steps have been taken to ease congestion, including the postponement of non-critical maintenance work. Such steps reduced wait times by more than 60 percent in the final quarter of 2015 (ICIS, 2015).

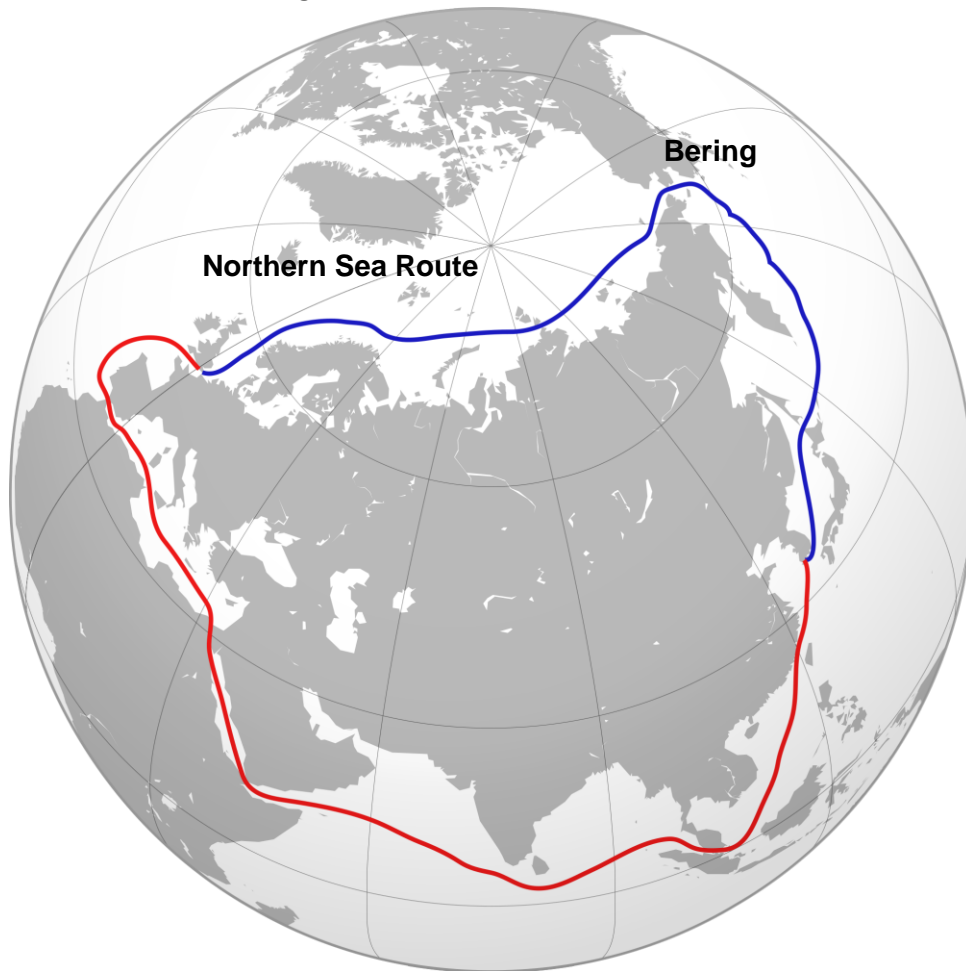
Further, 180 shipping casualties were reported between 1993 and 2013, although the safety record has improved markedly in the past few years, with only 27 casualties between 2003 and 2013. Bulk carriers, cargo ships and container ships had the highest casualties, accounting for over 75 percent of all incidents since 2002. There have been only six incidents involving LNG and petroleum product in this period. Contact with walls and collisions with vessels accounted for 60 percent of all incidents. The odds of a shipping incident occurring in the Panama Canal are around 1 FOR every 4,000 ships, compared to 1 for every 1,100 ships in the Suez Canal (Allianz, 2014). As the canal expansion nears completion, the entry of larger vehicles will pose new challenges in this regard.

2.2.3.3 Northern Sea Route

While climate change presents risks to maritime trade, it also opens up new channels of trade, which will involve its own set of risk dynamics. In particular, the Northern Sea Route (NSR) will be relevant to energy trade, as among other oil and gas fields, the Yamal LNG project with a terminal at Sabetta (expected to reach full capacity by 2021) located in the north of Russia, would benefit from sea trade with Asia via the Bering Strait, which separates Alaska (US) from Russia (Kallanish Energy, 2016). The NSR is not a single sea route, but an entire sea area north of Russia, as represented in Figure 2-8. It is navigable for only 20–60 days in summer due to the presence of Arctic ice cover in the winter (Javaid, 2014). The Bering Strait – used to enter the NSR from the east – saw traffic of 250 vessels in 2012, up from 130 in 2009 (Arctic Newswire, 2013).

With average global rising temperatures and melting polar ice, the NSR may remain open for periods of up to 170 days (in a 100-year scenario), increasing maritime trade on this route. Evidence already suggests that the Arctic ice is diminishing both in thickness and extension owing to climate change. The NSR could cut distances between Europe and Asia by as much as 50 percent compared to existing sea lanes in use, including the Suez and Panama Canals (Ragner, 2008).

Figure 2-8. The Northern Sea Route



Source: Wikimedia Commons.

Water depths in the various straits along the NSR are not very large. The Bering Strait ranges between 30 and 40 metres (but is 50 miles wide), while the shallower straits such as Yugorskiy Shar, Sannikova, and Dmitriya Lapteva are between 8 and 15 metres. Due to meteorological conditions, visibility can also be low due to snow, winds, and ice (ABS, n.d.).

The vessels that can navigate the NSR are currently much smaller than the Suezmax vessels (i.e. the largest vessels that can navigate the Suez Canal), and need to be 'ice-strengthened'. Further, even during summer months, the ice conditions on this route are unpredictable, which can add to delays. Oil and gas exports form a significant share of trade in the NSR. Currently, most shipments move from the Varandei terminal at the north of Russia towards Western Europe. As the NSR becomes increasingly navigable and major oil and gas export projects get further developed – including both Varandei and Yamal – shipments headed towards Asian countries will grow. Additionally, while there has been no 'ordinary'

commercial transit by a non-Russian vessel in the NSR that may change with more predictable ice patterns and longer periods of navigability caused by climate change.

Due to the need for the ice-strengthening of ships, ice breaking escorts and possibility of damage, ship operators have to deal with the risks of higher costs and insurance premiums, even as the distance is shortened. There are also challenges posed due to jurisdiction and regulations. For instance, Russia demands (i) notifications by all vessels entering its 200 nautical mile EEZ, (ii) an application for guiding of vessels, and (iii) a mandatory 'ice breaker' fee to use the route. Stringent regulations are also in place over ice-class standards of vessels, IMO Guidelines for Ships Operating in Arctic Ice-Covered Waters, and stricter port state regulation in the EU and other nations, which make it more challenging for shipping companies to use the NSR for trade.

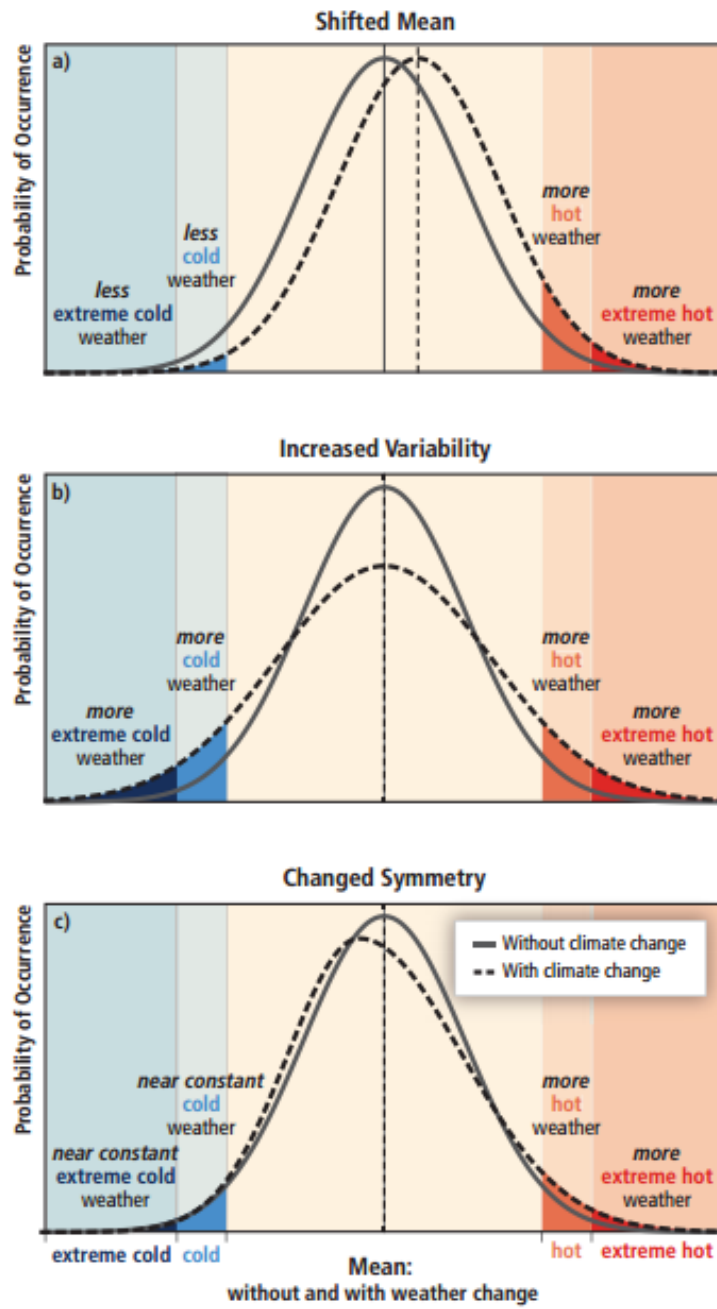
Further, while Russia claims that all straits between the Russian Arctic archipelagos and the mainland are its internal waters, the United States claims they should be considered international straits open to transit passage (Ragner, 2008). Geopolitics in the region has also been influenced by non-Arctic nations launching Arctic missions, and disagreements that Russia has had with other littoral Arctic states over the extent of its exclusive economic zones and delineation of boundaries (Javaid, 2014). Clarity over jurisdictions and ease of transit regulations will play a major role in the development of this sea route, however, it may take up to 30 years of changing climate for this route to become a reliable alternative to other routes. Therefore, risks and uncertainty will continue to affect shipping in the NSR for the foreseeable future, and trade will remain low due to geographic and meteorological reasons.

2.2.4. Extreme weather events

The Intergovernmental Panel on Climate Change's (IPCC) 'Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation' (SREX) reports that 'A changing climate leads to changes in the frequency, intensity, spatial extent, duration, and timing of extreme weather and climate events, and can result in unprecedented extreme weather and climate events.' Climate change is expected to impact global temperatures by increasing the mean temperatures and increasing variability, as represented in Figure 2-9. Thus, extreme climate events such as typhoons would increase in frequency and intensity.

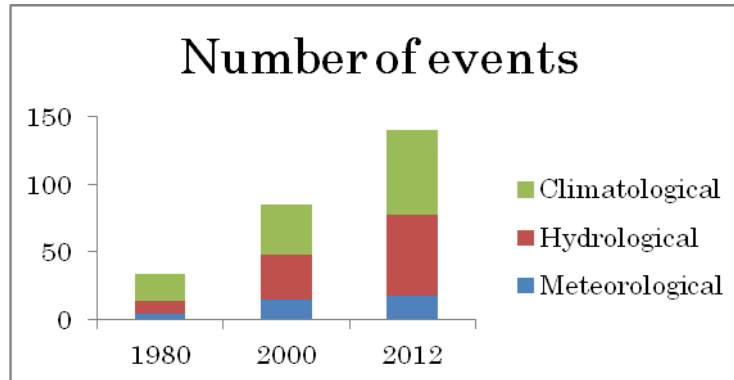
In fact, climatological, hydrological, and meteorological events are already rising. Figure 2-10 below shows this trend in the case of Southeast Asia.

Figure 2-9. Impact of Climate Change on Temperatures



Source: IPCC SREX.

Figure 2-10. Rising Trend of Climatological, Hydrological, and Meteorological Events



Source: Munich Re, NATCat Service.

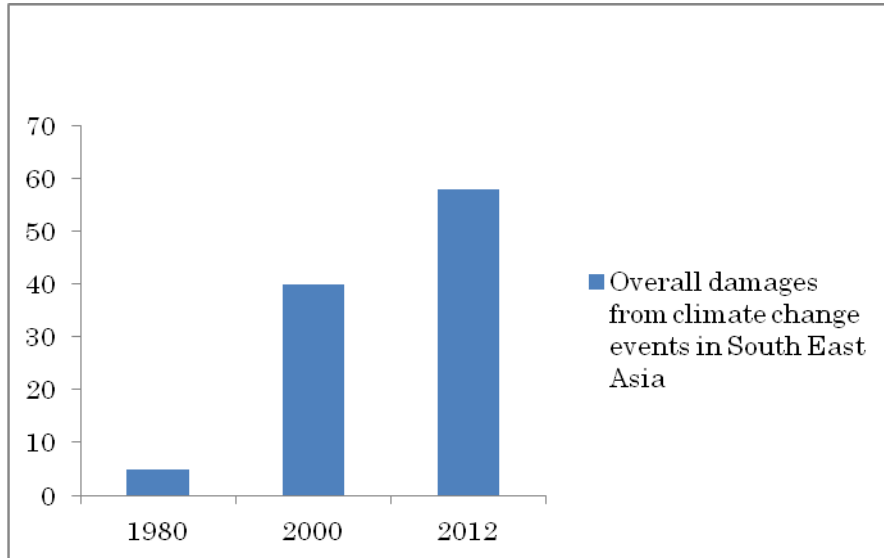
Tuleya (2004) suggests that there is a chance of increases in tropical cyclone intensity in Southeast Asia. Tropical cyclones can bring wind and storm surges which can pose risks for maritime movements for oil and LNG. Analysis from the Munich Re database shows a strong upwards trend in insured losses caused by severe convective storms (Figure 2-11). These damages and occurrence are likely to increase with the adverse impacts of climate change. In particular, the northern part of the Southeast Asian region has a chance of being affected by change in tropical cyclone characteristics (Tuleya, 2004). Knutson and Tuleya, (2004) through a modelling study, validates the likely increase in wind intensity (stormy winds) in the Southeast Asian region which can impact the sea lane movement of oil and LNG.

Vos et al. (2010) also substantiate this finding, indicating a rise in climatological events and damages in the Southeast Asian region in future. This can in future impact the sea lane traffic.

The IPCC SREX report reveals that there would be a shift in mean temperatures within the Southeast Asian region. Along with this, temperature variability can also increase in the region with an increasing occurrence of storms and typhoons. All these can potentially affect maritime trade and the economic outputs of the industries dependent on maritime trade.

Further, studies such as that of Cai et al. (2014) suggest that extreme El Nino events will increase in frequency due to climate change, and these would have 'profound socio-economic consequences'. While this could impact economic development, piracy, and political movements there could be direct impacts on maritime trade. Already, El Nino weather phenomenon has been blamed for congestion at the Panama Canal in October 2015, when wait time for vessels increased to as much as 10 days (ICIS, 2015) (Hutchins, 2015). Extreme weather events also increase instances of accidents and casualties in the Panama Canal, therefore increasing costs and delays, as has already proven to be the case (Allianz, 2014). As such El Nino activity increases in frequency, steps will need to be taken to manage maritime trade and minimise delays.

Figure 2-11. Damages from Climate Change Events in Southeast Asia (US\$ billion)



Source: Munich Re, NATCat Service.