

Greening the Maritime Sector from Military Perspective.

Sea passages are the lifelines of global trade and vital to the economies of many countries around the world. An estimated 90% of world trade is carried by seaborne transport owing to its economic advantages over other modes of transport. As demand for all manners of raw materials and manufactured goods grows together with the growth in global population, trade and economy, shipping is set to figure prominently in charting global economic growth.

Given these, the influential role of the maritime sector which encompasses activities such as shipping, port operations, shipbuilding and ship repairing, among many others -is set to grow in the future. However, the global maritime sector is also under increasing pressure to carry out its activities and business in an environmentally friendly manner, as concern over the adverse effects of climate change and pollution to the sea mounts.

Discuss what are the issues, challenges and opportunities that Malaysia faces in greening its maritime sector.

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Executive Summary

According to the International Maritime Organisation (IMO), around 90 percent of world trade is carried by the international shipping industry, represented by 50,000 merchant ships transporting every kind of cargo and manned by over a million seafarers of virtually every nationality.

Human advances in technology have steered the industry from the paddle, through the sail, to today's fuel, fed into an engine room that rotates propellers to move the ship forward through the water. Approximately 90 percent of all commercial shipping vessels are propelled by bunker fuel, a cheap crude oil distillate notorious for its high 3.5 percent sulphur oxide (SOx) content and dangerous vapours.

Being a country surrounded by seas, Malaysia is highly dependent on the seas to generate economic activities. 95% of our international trade is carried by seaborne transport and our ports are key gateways to this trade. As a responsible member in the IMO Council, Malaysia has adhered to best practices as well as amending ordinance which is related to marine pollution in the currently used Merchant Shipping Ordinance (MSO) 1952.

Greening the maritime sector from the perspective of military is found to be something new to Malaysian defense forces, but not for countries like United State of America and the European nations. The ideas to go green for the US Navy was translated in their Transformation Plan 2014-2016. Similar plan was laid down by Danish Ministry of Defense's green policies 2012-2015, which covers climate and energy strategy as well as compliance of the civilian rules and regulations.

Royal Malaysian Navy (RMN), a maritime defense entity under Ministry of Defense (MINDEF), Malaysia, has to mitigate what are the challenges and opportunities available if they want to adopt the idea of greening the service. This paper highlights challenges and also recommends several opportunities to encourage as well as facilitate efforts to green the RMN's and its service.

In short, greening the maritime sector from the perspective of military focuses on reduction of carbon emission, ballast water management and developing new apparatuses for sustainability.

Introduction

Maritime passage and waterways are the lifeline of the world trade and economies of many countries, and their vital role is set to continue into the future. To emphasize further, an estimated 90% of world trade is carried by seaborne transport, hence positioning the maritime sector as a crucial facilitator of global trade. As for Malaysia, the maritime sector continues to grow and expand to facilitate global trade and maritime-related activities. Being a country surrounded by seas, Malaysia is highly dependent on the seas to generate economic activities. 95% of our international trade is carried by seaborne transport and our ports are key gateways to this trade (Khalid, 2012).

While the sector is rising steadily, it also faces growing pressure and challenges to operate in an environment-friendly and cost effective manner. Among other issues, the maritime sector faces includes the cost of complying with environmental regulations, lack of technology to go green, and pacifying the competing interests and priorities of their business and society (Khalid & Tang, 2011).

Similar issues from the perspective of military especially the RMN needs to be addressed as an entity who plays an essential role in the maritime sector, exclusively in area such as security of sovereignty, naval port operations and naval ship maintenance and repair, among many others.

However, limited studies were found in the area of greening maritime sector from the perspective of military. Most of the research found are mainly focused from the perspective of economy which measures contribution towards the Gross Domestic Product (GDP) of a nation.

On the other hand, the purpose of RMN is to circumnavigate around the nation's waters, to protect sea-lanes from subversive elements as well as to demonstrate appropriate corporate social responsibility (CSR) and sustainability in maritime community. The CSR and sustainability are very much tied to the area of greening the maritime sector.

The closest research on greening maritime from the perspective of military was written by Chambers and Yetiv (2011) which highlights the usage of fossil-fuel alternative in driving US Navy while maintaining as world's sole superpower.

Issues and Literature Reviews

The purpose of the following literature reviews are to highlight **two most important and critical issues** surrounding the greening of maritime sector. The issues are **gases released by ships from their funnels** and **contaminated water with chemical substance which is pumped out of ship's ballast water tanks** when they call at ports. These issues have been intensified by International Maritime Organisation (IMO) in recent years as the organisation has been promoting preventive pollution as one of its original aim since inception in 1948.

In 2009, cited from Khalid and Tang (2011), IMO's Greenhouse Gas Study predicted that the portion of global carbon dioxide emission from shipping would increase from 3.3% from 2007 levels to as much as 20% by 2050 if no serious action is undertaken. An average increase of 11.8% annually for the next 43 years which is considered alarming in the maritime sector.

In a report published by Lloyd's List in December 2009 titled Future of Shipping, it is argued that shipping must adapt to a low carbon future and not delay any further in taking actions to deal with the changes that lie ahead in a world that demands industries to curb carbon and greenhouse gas (GHG) emission.

In an article published by Lloyd's Register of Shipping (LR), (1995), exhaust emissions from a marine diesel engine, the predominant form of power unit in the world fleet, largely comprise of excess carbon dioxide and water vapour with smaller quantities of carbon monoxide, oxides of sulphur and nitrogen, partially reacted and non-combusted hydrocarbons and particulate material. The gas contains a mixes of substance such as carbon dioxide (CO₂), nitrogen oxides (NO_x) and sulphur dioxide (SO₂). In a study conducted by Endresen et al., (2007) indicates that the emission of CO₂, NO_x and SO₂ by ship corresponds to about 2-3%, 10-15% and 4-9% of the global anthropogenic emissions.

The reason why such emission with excess of CO₂, NO_x and SO₂ is due to the usage of cheaper oil which is unrefined crude, laden with sulphur and other substance compared to when the oil is refined (The Economist, 2013).

When released in the air or nearby human ecosystem, fine soot that releases from the fuel may cause premature deaths from asthma as well as heat attack.

In 2005, IMO has started to limit the sulphur content maritime fuel and encourage ships to burn better grade of fuel and to reduce the emission of toxic gases. Such oil currently cost about 50% more than unrefined residual grades oil. This regulation came into force through MARPOL Annex VI.

Being a member of IMO, Malaysia has ratified major IMO conventions in relation to prevention of pollution from ships. Malaysia has also taken proactive measure in amending the Merchant Shipping Ordinance (MSO) 1952 which is related to marine pollution [Merchant Shipping (Amendment) Act 1991]. Under the newly inserted Section 306, issues defining act of pollution (intentionally or unintentionally) and action taken against parties who initiated the pollution were clearly addressed. However, the new part of the Ordinance has yet to comply with any international convention on marine pollution, particularly MARPOL 73/78. Nevertheless, Malaysian government is in process of passing a new Merchant Shipping Act to replace MSO 1952 (Khalid & Tang, Greening the Malaysian Maritime Sector: Issues, Challenges and Opportunities, 2011). Since the MSO 1952 and the proposed new Act is only addressing issues related to merchant shipping, these laws does not cover military vessels in preventing pollution related issues.

Besides emission of gases from ships, ballast water also contribute to the sea water pollution while discharging waste water at home ports and ports of call. According to Khalid and Tang (2011), ballast water is water used to maintain the stability of a vessel and is primarily composed of water, stones, sediment and thousands of aquatic organisms. When water is discharged from the ballast water tanks in a marine environment, the aquatic organisms in the ballast water can inhabit and invade their new environment and disrupt the natural order of its ecology.

Why ballast water is considered harmful to the marine ecology? While ballast water is being discharged and mixes with sea water, it forms harmful algal blooms (HAB) which are highly toxic and indirectly kills many marine life. In April 2014, the Star Online reported an incident of fishes killed due to HAB near Straits of Johor. (Toxic tides: Risks from harmful, 2014).

Not only marine life, human is also being effected by HAB. In 2013, shellfish poisoning due to HAB claimed three lives and over forty people fell ill in Sepanggar and Inanam, both near Kota Kinabalu. This was considered the worst case of HAB since it was first reported in 1976. As such, ballast water has emerged as one of a major threat to the oceans and to biodiversity.

In overcoming the ballast water management issue, IMO has planned new rules on cleaning up ships' ballast water by adopting a study which was published in the Journal of Marine Engineering and Technology. The study suggested that in order to reduce the effect of ballast water in the ocean, a special ballast water cleansing unit need to be fixed on each ship (King, Hagan, Riggio, & Wright, 2012). However, it is estimated that around 60,000 ships worldwide would need refitting with one or more cleansing units, costing up to USD1.7 million each.

Since there are not much studies done on gases released and managing ballast water by military vessels, research done for merchant ships should be used as a benchmarks if defense entities especially the RMN wants to overcome pollution through gases released in the air and ballast water as well as going green in the near future.

Challenges faced by Royal Malaysian Navy (RMN)

Based on the issues discussed above, budget will be the main concern if RMN were to adopt the suggestion highlighted from the literature reviews. As we are well aware, Malaysia has cut its defense budget by over 2% for 2016. The amount allocated for defense was just RM17.3 billion, a decrease of 2.25% relative to the RM17.7 billion allocated for 2015 (The Diplomat, 2015).

If RMN's ships plans to go green by adopting the usage of a better grade of oil that contains less sulphur for all its ships, the organization will then has to pay an additional 50% more to purchase the oil. This will indirectly increase the operating expenditure as well as reduce the capital expenditure of the organization. Since the refined oil for ships is traded in US Dollar (USD), this makes it even more difficult for RMN to consider purchasing the oil. RMN has an opportunity cost constraint between capital expenditure and operating expenditure to suit not only their priority but their needs as well.

Another challenge faced by RMN when going green will be the installation of the new cleansing unit to manage ballast water. RMN has an ageing fleet as many ships are over 30 years of age and considered old by international standard. If RMN were to install the new cleansing unit (one on each ship) to manage the ballast water system, RMN has to spend an average estimation of RM 438 million¹. Since the price of the cleansing unit is quoted in USD, RMN has to pay more again to purchase the equipment. This leaves RMN with constrain to choose whether to spend the money to install the cleansing unit or to purchase new ships which includes installation of the cleansing unit. RMN again need to decide whether to spend on capital expenditure or operating expenditure.

Reference Case

As mentioned earlier in this paper, the closest research on going green from the military perspective is found in an article written by Chambers and Yetiv (2011). This paper has highlighted an important and interesting point on developing new technology to reduce dependency on fossil oil and move toward cleaner technology.

How does this idea came about? With the increase of fossil oil price in 2008, the US Navy has to find ways to reduce their spending on operating expenditure. Ray Mabus, the Secretary of Department of Navy was adamant in sourcing for alternative energy and to lead the US Navy in sustainable energy. This partly coincide with the newly elected President, Barack Obama, who put energy and the creation of “green job” on top of his agenda. This indirectly gives the Navy a stronger political support in developing biofuels.

The idea to revolutionize energy technology to power tactical vehicles brings the usage of biofuel into picture. Since the US Navy and the US Marine uses tactical vehicles which includes air, land and sea based vehicles, the fuel consumptions is overwhelming and the need to find an alternative fuel brought them to the idea of Great Green Fleet.

With in-depth research, the US Navy finally discovered camelina based biofuel which behave exactly like a traditional fuel but cut “cradle to grave” carbon emission by 84%. Camelina Sativa originated from Europe and is a member of the mustard

¹ USD1.7 million x 60 ships x RM4.30

family, along with broccoli, cabbage and canola. Camelina needs little water or nitrogen to flourish and can be grown on marginal agricultural lands. Oil from camelina can be converted to a hydrocarbon green jet and ship fuel that meets or exceeds all petroleum jet fuel specifications. The fuel is a "drop-in" replacement that is compatible with the existing fuel infrastructure of aircraft and ships.

As for price per barrel, the more camelina based biofuel is produced, the cheaper the cost of production will be due to economy of scale. On average the price is cut down by 50% as compared the price per barrel of fossil oil. This has indirectly created new "green jobs" as the infant industry produces huge production of biofuel to support the Navy and the Marines.

RMN's Potential and Opportunity - Way Forward

Based on the facts highlighted above and in the author's opinion, RMN has great potential in exploring the above points for going green. As mentioned briefly by the Chief of Navy at a Hi-Tea function with all Honorary Officers and selected Reserve Officers on 14th of January 2016 at Wisma Pertahanan, RMN will undergo a transformation program and the plan will be unveiled to the public during the Navy Day Celebration this year. Part of the transformation program is to reduce 15 classes of ships to 5 classes on ships while maintaining the same number of ships which is 60 vessels.

Perhaps when introducing the transformation program, RMN should also consider that one of the 5 classes of ships might be using alternative fuel such as biofuel as part of the agenda. This agenda not only will drive innovation by ensuring the availability of resources but support alternative energy effort to move towards greening the military maritime sector. An execution strategy should also be introduced by forming an expert group which may comprise players from industry, academician as well as policy makers so that they are able to close the gaps of complex issues as RMN move on to implement the new transformation program.

RMN may pursue the transformation program by collaborating with Science and Technology Research Institute for Defense (STRIDE) in developing biofuel as an alternative energy efforts. RMN should exploit the opportunity to explore in developing biofuel development from palm oil as Malaysia is second largest

producer of palm oil in the world. The exploration of developing a new alternative fuel to power navy vessels doesn't stop there but it also give an opportunity to create new jobs in the area of biofuel while increasing the production.

Besides that, RMN also should consider that all newly designed ships to meet the alternative energy standards whereby one of the criteria is to retrofit power generated equipment and hull alterations. The upgrades to hull design will reduce wave resistance, altering water flow and cut dragging. This can be costly but they can increase fuel efficiency tremendously as well as save millions of ringgits.

The design consideration also should include the ballast water management system to reduce the pollution of water near ports managed by RMN. The installation of the ballast water management system be accompanied by an enforcement framework by encouraging all ports under RMN to adhere by operating in an eco-friendly and sustainable manner. As for foreign navy vessels that uses Malaysia ports as their port of call, a memorandum of understanding needs to be created and agreed upon when comes to discharging of ballast water at the port area. By introducing such efforts, it not only protect but preserve the marine environment near our ports.

Conclusion

RMN's vessels are warships and therefore not subject to the civilian laws under UN IMO and the national environment policies and regulations in Malaysia. However, regardless the exemptions of navy ships' compliance, RMN should consider complying the civilian rules and regulations as long as it does not cause operational limitation.

If the RMN is serious on greening the maritime sector, it should gain public support through public relationship exercise carried out carefully. Public support is essential in ensuring the efforts to go green become an important agenda. The public should be well informed about the greening maritime concept, elements involves, the benefits especially in the long run and parties involved to nurture better understanding.

As mentioned by Khalid and Tang (2011), developing a national strategy to green the maritime sector, strengthen linkages among relevant agencies and increase R&D

to green the maritime sector are some of the key point RMN can take into consideration to move towards greening from the military perspective.

Nevertheless it is the duty of RMN's leaders to conduct a comparative cost benefit analysis before deciding on what is practical without jeopardising the transformation program. The analysis will provide a clear vision on optimal solutions available to be undertaken by RMN. On the other hand, if these ideas are successfully planned and well implemented, RMN will be the first military organisation to operate green vessel(s) and can be a role model for other navies in this region in adopting alternative energy solution.

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