MARITIME SCENARIOS

Exploring the Futures of Maritime Security

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Contents

Introduction

The maritime domain is essential to global trade, regional development, and human security. Being a vast and complex domain, it is exposed to a growing number of interlaced challenges. Shifting geopolitical winds, disruptive new technologies, and age-old maritime issues all combine to create significant uncertainty around the future. This report is an initial, broad brush exercise, using some of the tools of strategic foresight, to explore the potential impact of various future trends and emerging issues on the maritime industry. The aim is to demonstrate how changing market forces and emerging issues will have differing levels of effect on the future of the shipping industry and how these may bring about changes. This initial exercise does not attempt to predict the future of the maritime industry but explores some possible trajectories as a demonstration of how long-term change can be driven. Additional more detailed work can be done to develop a variety of approaches and methods to help organizations anticipate and plan ahead for likely changes and challenges.

Background

In 2017, the global economy and world trade are greatly dependent on the merchant shipping industry, which carries 90% of all trade[i]. There are over 50,000 merchant ships traversing the globe carrying everyday goods, raw materials and energy supplies between nations, contributing over $400 billion annually to the global economy[ii]. The world fleet is registered in over 150 nations, and is manned by over a million seafarers from virtually every nationality[iii]. This complex, multijurisdictional industry has high upfront costs and is vulnerable to risks presented by inclement weather, maritime criminality, fraud, market fluctuations and international security concerns.

Decreasing global trade since the 2008 financial crisis has significantly impacted the shipping industry. The *AP Moller Maersk* Annual Report, December 2016 showed that the company's revenues have fallen by 15.3% in 2015 and a further 17.3% in 2016[iv]. A recent *Deloitte* report explained how the slowdown in revenue, coupled with elevated levels of debt has raised questions of sustainability for a few shipping companies. These figures, coupled with the increased costs associated with maritime criminality such as Somali piracy, has called into question the future sustainability of the maritime industry. Furthermore, international conventions such as the Ballast Water Management Convention and IMO Global Sulphur Cap 2020 will have significant financial implications for the shipping industry. Financial uncertainty and future regulations make it apparent the shipping industry needs to modernize to adapt to future challenges. Work is under way on this, for example, *INTRAA* recently produced a white paper on the long and short-term future of the shipping industry[v] inspiring a project in Antwerp and a cross-industry collective of 20 global shipping companies have come together to support the Sustainable Shipping Initiative[vi] but each company will need to take change into consideration during business planning.

The oceans cover over 70% of the Earth's surface and yet the majority are classified as "international waters" lying outside domestic or international jurisdiction. The UN Convention on the Law of the Sea (UNCLOS 1982) designated each coastal State territorial waters (TTW) out to 12 nautical miles (nm) from the coast and the right to declare an Exclusive Economic Zone (EEZ) out to 200nms[vii]. TTWs and EEZs provide a level of governance of the water column and sea bed, however, they cover such huge geographical areas that enforcement in many States is almost impossible. Consequently, the maritime domain provides a considerable security challenge to maritime trade, as demonstrated by Somali piracy.

Traditionally, protection of the freedom of movement for maritime trade has been provided by flag States through naval sea power. However, since the 2008 global financial crisis, a

number of traditional western maritime powers with competing resource implications, have made significant cuts to their navies and coast guards forcing increased international cooperation and a consolidation of shared maritime resources. In contrast, emerging powers, such as India, China and Brazil are developing stronger, more capable maritime forces. This has led to a shift in the provision of security in the maritime domain. Furthermore, land based instability and conflict has increased maritime criminality, including piracy, drugs, weapons and human trafficking. A combination of unemployed naval personnel and an increase in the threat of piracy to shipping off the coast of Somalia has led to significant growth in the private maritime security sector, which in itself has created jurisdictional and logistical challenges including the creation of floating armories in international waters. Initially this industry provided armed security teams on board merchant ships, but it is likely this industry will evolve to take on additional roles traditionally provided by the State.

The merchant shipping business model is incredibly complex with a number of different parties having a stake in each voyage. Upfront costs and risk are high making companies vulnerable to volatile markets, safety and security challenges. These complexities make this international industry hard to police for fraud and other criminal activities including trafficking and illegal oil bunkering. There is a project underway exploring the utility of blockchain in shipping[viii], but 51% of the industry are still submitting shipping instructions and booking through phone, fax or email[ix] slowing transactions and adding to the risk of white collar fraud. While the shipping industry is clearly vulnerable, it is also essential and lucrative, supporting $400 billion in trade annually. In addition, the shipping industry supports a number of associated and lucrative industries. Lloyds of London, the largest maritime insurance provider makes annual pre-tax profits of around £2000 million[x] and the private maritime security industry was reportedly worth $15.6 billion a year in 2015[xi].

Did you know a very large cargo ship can carry so many containers that if you put them on a train it would be 67miles long!

Drivers of Change

To explore the futures of the maritime domain, VFS developed a set of original scenarios, each of which details one possible trajectory into the future. To develop these forecasts, we used a set of key foresight building blocks and used them in some basic futures analysis. As a first step, we developed an initial systems map of the maritime domain. Systems maps are used to illustrated how the various elements of a complex system are interrelated. In the maritime case, the resulting map conveys the inherent complexity of the present system, depicted in Figure 1, below.

Using the map as a guide, we next identified key historical trends that have been exerting pressure on various elements of the maritime system. Trends, being descriptions of historical change, are one of the main building blocks of good foresight work. In the case of the maritime domain, the trends identified included issues such as climate change, declining size of Western navies, and human migration.

Trends are not the only important building blocks, however. Good foresight work also use *emerging issues*, which are new technologies, policy issues, or concepts and ideas that are experimental or fringe today, and could mature into important drivers of change in the future. Again, using the map as a guide, we conducted an environmental scan and emerging issues analysis to identify some of the emerging issues that could drive change across the maritime system in the future. Among the many emerging issues were things such as advances in renewable technology, floating armories, and land reclamation.
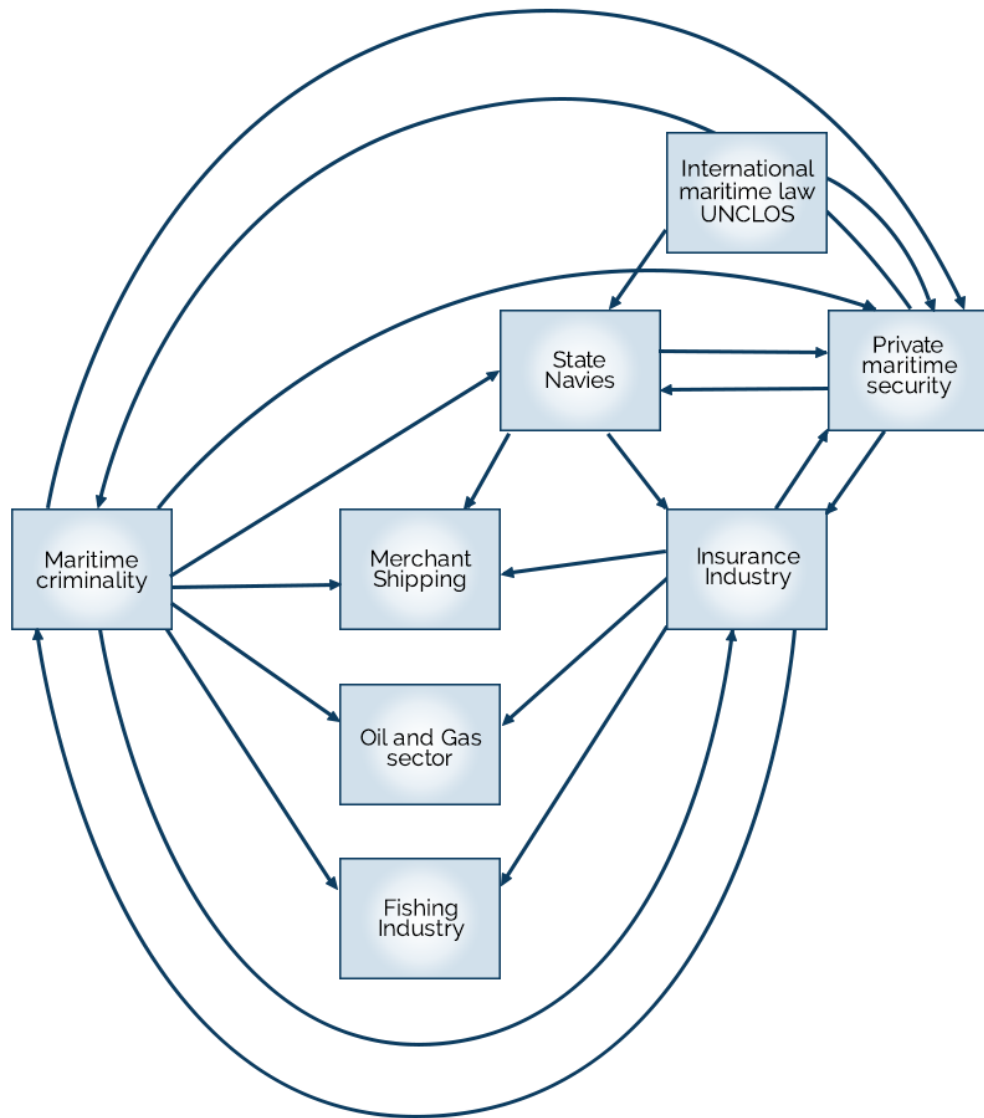
Figure 1: A Systems Map of the Maritime Industry

It is likely that in the future a number of these trends and emerging issues will significantly impact maritime trade, maritime security and the maritime domain more widely. In this project, we found that trends and emerging issues across issues such as governance, trade, markets, transport, technology, maritime security and climate change could have significant impacts on the future. *Figure 2*, below, shows the various trends and emerging issues (TEI) mapped against the maritime systems map.
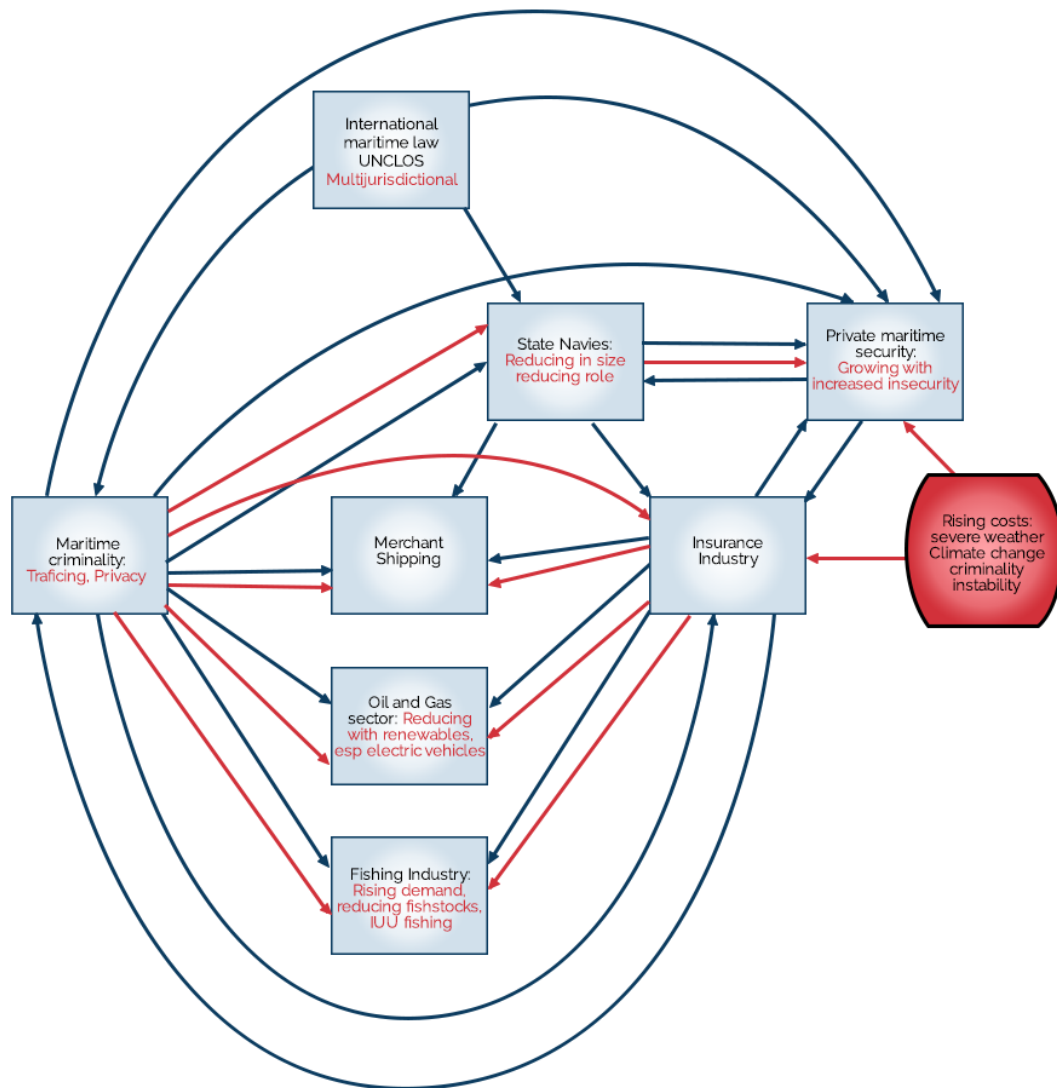
Figure 2: TEI Mapped Against the Maritime Domain System

Scenarios

Scenarios are descriptions of alternative possible futures. Scenarios are one of the workhorse tools in futures and foresight work because they allow us to: a) deal with uncertainty and limited information by forecasting multiple scenarios at a time; b) explore and convey complex situations and changes in an easy-to-understand format, and; c) provide groups with compelling images of counterintuitive or unconsidered possibilities about the future.

Using our systems maps we have explored the potential impact of trends and emerging issues on the maritime domain and developed four potential future scenarios that could come about as a result of them driving change in the system. These scenarios provide two types of forecasts: those that explore a world which assumes drivers will create broad and transformational changes across the maritime domain, and those that explore significant yet less disruptive changes across maritime system. For each of these we are looking considerably into the future and considering a horizon of 2050 and beyond.

The scenarios we have developed are:

- *Fall of Maritime Trade*: Technological advances in renewables, manufacturing, transport and food production coupled with climate change and socio-political trends significantly reduce the use of the ocean by industry and navies, changing the security dynamic and increasing maritime criminality.
- *Water World*: Climate change and growing global populations force a diversification of the maritime domain. Increased land reclamation and ocean based cities characterize this active maritime domain and maritime criminality has sharply risen.
- *Business as Usual*: Continued globalization and increase in global trade, low level maritime criminality, slow reduction in fossil fuels replaced by other minerals to support renewables.
- *Hybrid Maritime World*: The merchant shipping industry has planned ahead and adapted, lowering upfront costs, reducing risks and ensuring the continued growth of the industry.

It is important to point out that scenarios are not predictions: they are at most forecasts of logical but different ways in which the future could unfold. They are, therefore, not attempts to get the future "right" but rather a structured way of exploring possible futures. These possible futures can help to challenge assumptions and allow for more accurate and sustainable planning. The diagram below demonstrates how these scenarios can be

mapped against a continuing forward trajectory. Some scenarios demonstrate disruptive change and others continuity.
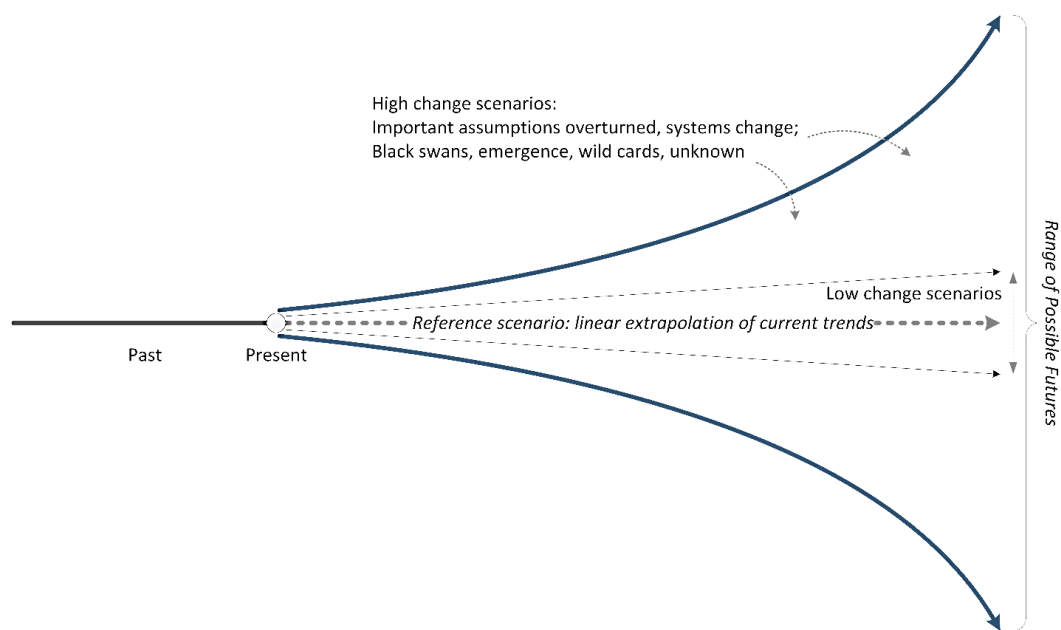

High change scenarios:
Important assumptions overturned, systems change;
Black swans, emergence, wild cards, unknown

Low change scenarios

Reference scenario: linear extrapolation of current trends

Past   Present

Range of Possible Futures

Figure 3: VFS Cone of Uncertainty/Range of Futures Diagram

Fall of Maritime Trade (Disruptive change)

Technological advances in renewables, manufacturing, transport and food production coupled with climate change and socio-political trends significantly reduce the use of the ocean by industry and navies, changing the security dynamic and increasing maritime criminality.

Key Trends	Key Emerging Issues
Economic slowdown	3D-printing
Social political change: isolationism, anti-globalization, Bringing back local manufacturing	Hyper-loop
	Larger more efficient cargo aircraft
	Wireless electricity
Renewables/energy efficiency	Advances in renewable technology
Silk Road	Manufactured protein
Climate change	Automation
Food insecurity	Blockchain
Increased migration	Global sulphur cap
Environmental regulation	Ballast Water Management Convention

In this Scenario, the 2008 economic slowdown has continued to impact the shipping industry not helped by social-political trends towards localism with many international free trade agreements ending creating significant barriers to trade. Increased automation and advances in technology have reduced local production costs to a level competitive with overseas production. With appetite and need for trade reduced other transport systems now provide quicker, cheaper alternatives to maritime trade. Many smaller shipping firms already struggling to remain solvent, have now gone into administration. The merchant shipping industry has shrunk by over 60%.

Technological advances in renewable energy production have changed the face of global energy markets. Dramatically reduced demand for oil, gas, and coal, market volatility and reduced upstream investment have significantly reduced the market share for shipping. Consequently, all but the big oil companies have ceased maritime operations and those are operating significantly reduced fleets. Energy shipping has reduced by over 80% since 2017.

Climate change has caused harder to predict worsening weather conditions making sea voyages more dangerous. Insurance premiums for sea going vessels have risen dramatically, compounding financial difficulties and driving a further portion of the shipping industry out of business.

Depleted fishstocks and increased insurance costs have driven much of the international fishing industry out of business. A small level of artisanal fisheries is still seen off the developing coastal States in Africa and Asia, but these are limited to coastal waters due to regular severe weather. The international fishing industry now operates at 30% Of 2017 levels.

Reductions in maritime trade, fisheries and oil and gas exploitation has decreased the need for State navies. By 2050, navies have declined significantly, now only maintaining nuclear deterrence, disaster relief for weather and pandemics, and tackling maritime criminality, which now is mainly trafficking of weapons, people and drugs. The private maritime security industry continued to thrive and expand operations, taking over many roles traditionally provided by State navies. However, the reduction in the maritime industry has also now started to cause a number of these companies to go into administration.

Water World (Disruptive change)

Climate change and growing global populations force a diversification of the maritime domain. Increased land reclamation and ocean based cities characterize this active maritime domain and maritime criminality has sharply risen.

Key Trends	Key Emerging Issues
Population growth	Private maritime security industry
Climate change	Floating armories
Migration	Geo-engineering
Urbanization	Land reclamation
Food insecurity	Desalination technology
Closed migration policies	
Rising sea levels	
Severe weather	

By 2050 global population is over 9.7 billion, climate change, reduced fish stocks and increased urbanization has made food security the greatest challenge. Food insecurity has caused mass migration and a deteriorating global security situation.

People trafficking has increased, mainly at sea. Without sufficient naval forces and struggling internally with food security, States increased coastal border defenses. Seeing a gap in the market, private security and logistics companies partnered with traffickers setting up self-sustaining floating cities in international waters. These cities, made from old merchant ships and decommissioned oilrigs serve as floating farms using aquaponics, desalinating water and producing renewable energy.

At the same time, geoengineering to combat drought and land reclamation to counter rising sea levels has become the norm particularly in wealthy coastal urban centers, such as Hong Kong, London, New York, and Dubai. These areas have become increasingly populated with high rise accommodation. Urban gardens, water recycling and other technologies have been rolled out to sustain these richer populations. In addition, China has continued a policy of island construction in the Pacific similar to that it started in the Spratly Islands. Large populations have now migrated from South East Asia to these Chinese colonies. State level maritime disputes have increased over areas more appropriate for land reclamation. State navies are once again expanding, providing fisheries protection, maritime policing, disaster relief and traditional power projection roles reflecting the increased competition over territory.

In this evolving context, maritime criminality is rife, with competition for resource, overcrowding and massive inequality. Criminality has evolved from that seen in the early 2000s of land based criminals operating at sea, to more traditional pirate gangs living and operating on the high seas. Private maritime security teams are now a requirement on every merchant vessel transit.

Maritime trade continues, sustained by global inflation, and while insurance premiums and upfront costs have risen, they have generally done so in line with market values, enabling the continuation of the industry in this new, more volatile maritime domain.

Business as Usual (Continuity)

Continued globalization and increase in global trade, low level maritime criminality, slow reduction in fossil fuels replaced by other minerals to support renewables.

Key Trends	Key Emerging Issues
Continued growth of global trade (capitalism)	Private maritime security industry
Declining traditional western navies	Renewables technologies
	Sustainable shipping technologies
	Improved shipping architecture plans
	Improved fisheries technology
	Automation
	Blockchain

This scenario assumes global markets have recovered and continue to grow, accompanied by a steady increase in maritime trade. While there have been developments in technology offering other, more competitive transport systems, these have largely impacted a different segment of the market. The shipping industry continues to be a lucrative industry balancing expensive upfront costs with high returns. Maritime criminality continues to present a low level, manageable risk, although hot spots, likelihood and the modus operandi of attacks differ depending on land based insecurity, for example, piracy and trafficking have increased significantly off the coast of Venezuela and SE Asia. Advances in technology such as blockchain and better designed ships have reduced voyage costs while improving seafarer safety. State navies have continued to decline and allied nations work together on disaster response, maritime criminality, capacity building and more traditional diplomatic tasks. The private maritime security industry has continued to grow, taking on some roles from traditional navies. They continue to provide on-board teams for merchant vessels and

the logistical support for these teams, however, now they also provide fisheries protection and capacity building services for weaker states, filling the void by reduced state navies.

The fishing industry continues to grow with new technologies allowing exploitation further out to sea. Fish stocks are steady as the result of global fisheries management plans despite Illegal, unreported and unregulated (IUU) fishing continuing to blight these plans. Countries in Africa have now started to develop well managed international fisheries industries, supporting economic growth and contributing to global trade.

The maritime domain is increasingly used for renewable power generation, balancing the reduction in exploitation of offshore oil and gas. Advances in technology for wireless power transmission have enabled generation facilities to be built further out to sea without transmission challenges. Offshore mining has also diversified to support an increase in the demand for minerals to support renewables development. Organic water borne organisms are increasingly being used in renewable energy technologies and these are being farmed offshore. Automation in this sector has reduced the risk to life of maritime terrorism and criminality increasing safety of offshore facilities.

UNCLOS continues to support and regulate the maritime domain, having adapted easily to evolving uses of the maritime domain. Maritime domain disputes have reduced with appetite for offshore oil and gas. Freedom of movement remains a motive for maritime disputes, but shared objectives to combat maritime criminality have encouraged increased cooperation in the maritime domain.

Hybrid Maritime World (Continuity/progressive change)

The merchant shipping industry has planned ahead and adapted, lowering upfront costs, reducing risks and ensuring the continued growth of the industry.

Key Trends	Key Emerging Issues
Sustainability	Hybrid/zero emission shipping
Cost reduction	Safety/security design in ships
Local manufacturing/subsidies	Automation
Expansion of the fishing industry	3D-printing
Population growth	Fish tracking technology
Climate change	Blockchain
Environmental regulation	Ballast Water Convention
	EEID

The shipping industry has adopted a strategic approach to future change, adopting sustainable new technologies and designs which reduced upfront costs by 90%, while improving safety and security on merchant ships. Architectural design made ships more stable and less susceptible to severe weather while still holding large volumes of cargo. Automation and more secure designs reduced the number of seafarers required for voyages and better protected those on board from armed attack. Blockchain reduced the opportunities for fraud and criminality associated by rouge factions in merchant shipping reducing losses to the owners and brokers. All these changes, in turn reduced insurance premiums. Transits can now move much faster as fuel costs no longer factor reducing voyage times and increasing the number of voyages completed annually. The changes reduced the cost and charge for merchant shipping increasing market share. The increased business, along with reduced transit and insurance costs, very quickly paid for the costs of developing the new future proof fleet.

Advances in ship building technology such as automation, cheaper electricity and 3D-printing reduced build costs which revitalized traditional ship yards while not reducing business for the newer, previously cheaper facilities in the East. Insurance premiums reduced as ships became less prone to attack, damage or loss of cargo. The private maritime security industry became less important as new ships were harder to board and attack, many smaller companies went out of business and the larger ones branched out to different roles such as capacity building for states, mainly for fisheries protection.

Advances in technology for merchant shipping have also started to be adopted by the international fishing industry in wealthier countries. Reduced upfront costs, risks and insurance premiums making the industry more lucrative and reducing by-catch at a time when global demand for fish has risen dramatically and environmental regulations become more stringent. Fisheries are on the rise which is keeping prices affordable and supporting food security globally. The maintenance of food security from sustainable fisheries has served to reduce the risk and impact of migration. Fisheries is providing a good source of protein and income in developing as well as more advanced countries.

Conclusion

These scenarios are not meant to be predictions or forecasts of the future, but are a tool to better understand what drivers of change could impact the future of the maritime domain. The systems maps and scenarios enable us to explore the interconnectedness of the maritime domain and paint a picture of some alternative futures that could arise from the impact of trends and emerging issues. This exercise provides a safe theoretical environment to think about the potential future of the maritime domain. Such exercises highlight areas where change can be anticipated and allow better strategic planning in advance. Although, particularly the more dramatic scenarios, may seem unlikely to those currently working in the maritime industry, there are a number of strategic implications that can be learned from these scenarios to create a more sustainable future for the maritime industry. This exercise has been short and broad brush, it does not go into much detail, and consequently the conclusions it makes are also broad brush. However, with increased time and more detailed analysis better recommendations can be produced to help sustain the future of different aspects of the maritime domain, such as merchant shipping.

Strategic Implications

From the patterns in these very different scenarios, four strategic implications are apparent. They are as follows:

Firstly, the shipping industry, struggling since the 2008 global financial crisis, is vulnerable of market forces and shocks which will increase in future. Merchant shipping currently uses expensive, environmentally damaging fuel, limiting the speed and number of voyages. To make the business model less vulnerable to market volatility it is advisable the shipping industry take tangible steps to develop a fleet of more sustainable ships that are less expensive to run. Recent attempts at creating such ships have not yet been successful and a concerted effort will be required to facilitate change. Enterprises such as the Sustainable Shipping Initiative in Singapore are important, but the shipping industry as a whole will need to fully accept and support this change if it is to take effect in time to prevent significant losses in future.

Secondly, severe weather and maritime criminality will most likely continue to be a part of day to day life at sea. Just as newly designed ships can be made more sustainable to

reduce costs, they can also be made safer and more secure to reduce insurance premiums and risk to seafarers. This will also help to insulate the industry from market volatility.

Thirdly, given the changing nature of warfare, naval forces will likely continue to reduce. The resurgence in piracy attacks off the coast of Somalia demonstrates the vulnerability of merchant shipping to maritime criminality. Private maritime security contractors demonstrated their worth in deterring Somali piracy and continue to expand to new markets. However, despite the *Montreux Document*, *ISO PAS28007* and industry led accreditation, it remains unregulated except for flag state jurisdiction and UNCLOS which are hard to enforce on the high seas. The shipping industry and international community need to fully engage to create an international system of regulation and enforcement.

Finally, the fishing industry is going to become more important with growing populations and decreasing food security. IUU fishing already blights fisheries management plans impacting fish stocks and market sustainability. The international community need to renew focus on fisheries protection and policing to allow sustainable growth. If concerted action is not taken depleted fish stocks could cause a global food shortage and economic crisis causing mass migration and dramatically impacting peace and security

End Notes

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Appendix

The following lists contain all of the Trends and Emerging Issues used in the development of the scenarios and listed in the preceding pages.

Trends	Emerging Issues
Climate change	3D-printing
Closed migration policies	Advances in renewable technology
Continued growth of global trade (capitalism)	Automation
Cost reduction	Ballast Water Convention
Declining traditional western navies	Ballast Water Management Convention
Economic slowdown	Blockchain
Environmental regulation	Desalination technology
Expansion of the fishing industry	EEID
Food insecurity	Fish tracking technology
Increased migration	Floating armouries
Local manufacturing/subsidies	Geo-engineering
Migration	Global sulphur cap
Population growth	Hybrid/zero emission shipping
Renewables/energy efficiency	Hyper-loop
Rising sea levels	Improved fisheries technology
Severe weather	Improved shipping architecture plans
Silk Road	Land reclamation
Social political change: isolationism, anti-globalisation, Bringing back local manufacturing	Larger more efficient cargo aircraft
Sustainability	Manufactured protein
Urbanisation	Private maritime security industry
	Renewables technologies
	Safety/security design in ships
	Sustainable shipping technologies
	Wireless electricity

World Population
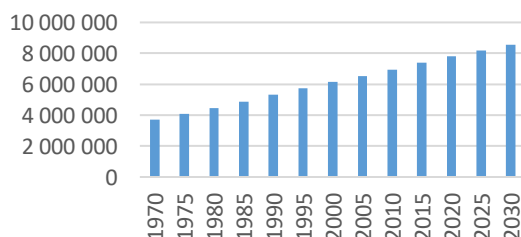
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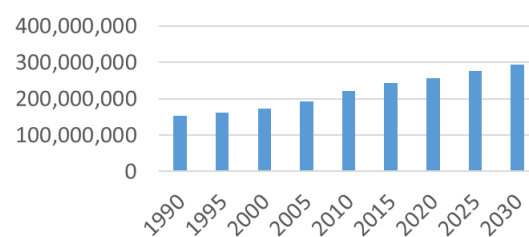
About Vision Foresight Strategy LLC

Vision Foresight Strategy LLC (VFS) is a foresight and strategic analysis firm headquartered in Honolulu, Hawai'i. VFS combines leading edge quantitative and qualitative foresight methodologies to assist government and corporate clients with anticipating the risks and opportunities presented by emerging conflict and security issues.

Drawing upon a global network of foresight and defense sector professionals, VFS produces a range of client products, such as horizon scans and detailed scenarios that combine quantitative forecasts with qualitative analysis. In addition to its core foresight products, VFS assists clients with a range of research, workshop design and facilitation, strategy development, and training and leadership development.

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Richard is an academically trained futurist and chief executive of Vision Foresight Strategy LLC. His professional interests include the futures of governance, conflict and security, and industrialism. Richard has conducted foresight and strategy work on projects for organizations such as the European Commission, the UK government, the US Department of Defense, and PepsiCo. He is the author of *4 Steps to the Future: A Quick and Clean Guide to Creating Foresight* and his contributions were featured in the book *Thinking about the Future: Guidelines for Strategic Foresight* (2006). He is adjunct faculty at the University of Houston, teaching the Advanced Strategies course for the Foresight Program, and a lecturer at the University of Hawaii, teaching the Future of Political Systems course for the Alternative Futures Program. Richard holds a PhD in Political Science from the futures studies program at the University of Hawai'i.

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Anna Butchart is a developing futurist, with over ten years of experience in the public, private and development sectors. After several years in finance and development working with a number of organizations including Bank of Scotland and UNICEF, Anna joined the Department of Energy and Climate Change as part of the UK negotiating team at the G8 international energy and climate change talks. Then moving on to draft the UK international energy security strategy and leading a review of civil nuclear security in Scotland and a number of English sites. After transferring to the Foreign and Commonwealth Office, Anna spent three years as the UK Government lead on tackling maritime criminality off the coast of West Africa before taking on postings at the British Embassy in Canberra, Australia and Tbilisi, Georgia. Anna holds a Bachelors in War Studies and a Masters in International Conflict and Security Studies, and is a PhD student in the Alternative Futures program at the University of Hawaii at Mānoa.