

National Security Implications of Climate Change for Sri Lanka Naval Forces

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Abstract - Climate change, both natural and man-induced, will cause the most serious environmental problems that will impact the national security of Sri Lanka in 21st Century. Climate change affects national security of Sri Lanka in many ways. Firstly, damage to the maritime domain habitability by inundating low line coastal areas and increasing extreme weather conditions. Secondly, less and slow adaptation of people in facing climate change, may causing chance to perpetrate unlawful acts and generating cross-border climate change migration pressures. Lastly, there may be impact of climate change resilience pressures in the Indian Ocean Rim which may also create climate refugee problems from regional counties, and place greater demands on marine foods and freshwaters as impacted populations may look into the sea to adapt the climate change impacts on land. A balance of marine environment, social and national security issues, extensive human and infrastructure developments are required to develop as a proactive policy measures in response to Sea Level Rise and climate change impacts near and around the Sri Lanka. A joint approach linking government national security strategy and multiple agencies with community participation at local level is an important element, which requires improving capabilities and livelihoods as means of equity and sustainability principles. The Sri Lanka Navy and Coast Guard should begin to consider potential specific force structure capabilities and training standards for conducting missions arising from, or affected by climate change, particularly in humanitarian assistance and disaster response and relief operations.

Keywords: Climate Change, National Security, Sri Lanka Naval Forces

I. INTRODUCTION

Climate change is the fundamental human development challenge of the 21st century. It is a growing crisis with economic, health and safety, foods production, security, and other dimensions in

Sri Lanka (De Silva, 2010). Sri Lanka is an island located in the Indian Ocean between 6^o and 10^o north latitudes and between 80^o and 82^o east longitudes. The territorial sea of Sri Lanka extends seaward to a distance of 12 nautical miles. The Exclusive Economic Zone (EEZ) extends up to a distance of 200 nautical miles. The extent of the territorial sea and the EEZ is 21,500 km² and 517,000 km² respectively; the latter amounting to 7.8 times of the total area of the country (CZMP, 2006)

United Nation Framework Convention on Climate Change (UNFCCC), in its Article 1, defines "Climate change" means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. Future it elaborate "Adverse effects of climate change" means changes in the physical environment or biota resulting from climate change which have significant deleterious effects on the composition, resilience or productivity of natural and managed ecosystems or on the operation of socio-economic systems or on human health and welfare(UNFCCC,1994).

U.S. Navy, 2010; argue climate change is a national security challenge with strategic implications for the Navy. While climate change alone is not likely to lead to future conflict, it may be a contributing factor. Climate change is affecting, and will continue to affect, military installations and access to natural resources worldwide.

The global maritime domain and the role of naval power in peacetime have changed significantly in recent decades. Naval forces that were organized, trained, and equipped for combat are finding themselves increasingly engaged in enforcing sanctions, chasing pirates, interdicting narcotics, and performing a host of other noncombat tasks. Naval forces have always been used for non-war fighting tasks during times of peace, but today the

strategic context is different. Today, naval action short of war can have strategic effects like never before, and the operating environment is increasingly complex. The modern context is different from that of the past largely owing to three factors: the impact of globalization on maritime commerce, changes in the threat environment, and the evolution of international maritime law (Luke, 2013). This paper is to investigate what does climate change means for Sri Lanka naval forces (Sri Lanka Navy and Coast Guard) in terms of the national security implications.

A. *Objectives and Scope*

The objective of this study is to fill the void between perspectives on maritime security and climate change, with particular attention to the Sri Lankan context and strategic interests. Three main research questions are posed to identify the research need to fill this void:

1. What are the security related impacts of climate change as they pertain to the regional Ocean?
2. How will climate change pertain to Sri Lankan maritime security interests?
3. How should the Sri Lankan naval forces, best prepare to mitigate or respond to these impacts?

The maritime dimensions of climate change are found to be significant; lawlessness at sea from the coasts of failing or fragile states jeopardizes the safety of maritime commerce, while increased natural disasters will demand greater naval involvement in humanitarian assistance.

B. *Methodology and Overview*

Climate change is a risk, one underpinned by uncertainties and variability. It is impossible to say with precision what the impacts of climate change will be, how severe they may be, or where they will be found. Issues like maritime piracy and the use of navies for disaster relief have only gained prominence in the years following. In other words, there is no reliable statistical dataset from which to construct a quantitative understanding of the maritime dimensions of climate change Gillis, (2010).

As a result of the uncertainty attached to climate change and limited experience with emerging issues, this study does not attempt to mount a

quantitative argument predicting the maritime dimensions of climate changes. Instead, this study generates by analysing a number of contemporary literatures related to climate change and maritime security. Finally offers recommendations and suggestions for Sri Lanka Naval forces to best prepare and contend with the maritime dimensions of climate change.

II OVERVIEW OF CLIMATE CHANGE AND STRATEGIC IMPORTANCE

a. *Global Overview of Climate Change*

The first decade of the 21st century was the warmest decade recorded and it was above average precipitation, including one year 2010 that broke all previous records. It was also marked by dramatic climate and weather extremes such as the European heat wave of 2003, the 2010 floods in Pakistan, hurricane Katrina in the USA, cyclone Nargis in Myanmar and long term droughts in the Amazon Basin, Australia and East Africa. The vast majority of the world's population lives within a few hundred miles of the oceans. The effects of climate change may also amplify human suffering through catastrophic storms, loss of arable lands, and coastal flooding, could lead to loss of life, involuntary migration, social instability, and regional crises (WMO, 2013).

IPCC, 2013; assessment report declaring the impacts of climate change on the critical infrastructure and territorial integrity of many states are expected to influence national security policies. Land inundation due to sea level rise poses risks to the territorial integrity of small island states and states with extensive coastlines. Some trans-boundary impacts of climate change, such as changes in sea ice, shared water resources, and pelagic fish stocks have the potential to increase rivalry among states. Further it explain climate change can indirectly increase risks of violent conflicts in the form of civil war and inter-group violence by amplifying well-documented drivers of these conflicts such as poverty and economic shocks.

b. *Regional Overview of Climate Change*

Climate Change which is a major challenge for humanity has emerged as an area of critical concern in the globalized world today. The regional organization in South Asia, South Asian Association for Regional Cooperation (SAARC) has taken several initiatives in this direction. Climate Change has

emerged as an important issue for SAARC as the entire region is threatened by its adverse impact (Delinic, and Pandey, 2012). The Indian Ocean forms the natural border to the South Asian subcontinent and it is a key area of vulnerability to climate change (Michel and Pandya, 2010).

Michel and Pandya, 2010; future explain the environmental migration within or between countries could create severe problems for regional and sectorial development as well as generate new socio-political instabilities from increased competition over scarce resources such as land, water, forests, and fisheries in many parts of the world. Around the Indian Ocean rim, millions of people are already living in urban slums without adequate employment or shelter. Delinic, and Pandey, 2012; argue new challenges and threats have emerged such as: non-traditional threats in the India Ocean, devastation through climate change such as the recent earthquake and tsunami which had a potential for not only interstate but also intrastate conflict on energy resources with region's economy, threat of pandemic diseases, piracy, transnational crime, demography leading to overpopulation. South Asia with one fifth of world population is an extreme disaster prone region. Over past forty years, South Asia faced as many as 1333 disasters that killed 980,000 people, affected 2.4 billion lives and damaged assets worth \$105 billion.

c. *Climate Change Impacts of Sri Lanka*

Sri Lanka's total population which accounted to 20.33 million in 2012 and Sri Lanka is considered as one of the densely populated countries in the world and 56% are located with sea frontage. The coastal zones of these districts have been identified as highly vulnerable to rise of sea level. The Sri Lankan coastal zone contains 34 percent of the country's population and represents 24 percent of the total land area. The capital city Colombo and 50 percent of Municipal Councils and another 50 percent of Urban Councils are located in the coastal zone and 80 percent of industrial units are found in an around the major cities located in the coastal zone. However pressure fluctuation in the Bay of Bengal brings about a chain of changes in the weather conditions in Sri Lanka. The increasing frequency formation of low pressure centres in the Bay of Bengal increase occurrence of cyclones with global warming (De Silva, 2010).

De Silva, 2010; explain the full extent of climate change impacts on Sri Lanka is still being of studding, but there is a growing recognition that climate change could threaten Sri Lanka as an island nation and developing county. Centre for Environmental Justice, 2009; report mentioned the government of Sri Lanka is not very progressive in the climate talks; Since Sri Lanka is not within the Island Nations Category or Least Developed Country Category. So, it has limited opportunities so far in the UNFCCC discussions. However, report mentioned Sri Lankan majority of the public more than 58% are still unaware of the concept of global climate change and its possible causes and impacts. Senaratne, 2014, Ranasinghe, 2012 and De Silva, 2010; mentioned Climate Change aggravates the disasters by enhancing the extreme weather conditions like stormed surge, drought, erratic rainfalls and epidemics are among the most pronounced disasters in the urban areas. Occurrence and frequently of these disasters have become more critical on the face of the projected impacts of climate change in Sri Lanka.

Centre for Environmental Justice, 2009; survey report contribute that the rainfall intensity of the country has increased when compared with the past. More than 60% of the people stated that the rainfall intensity has increased severely in the recent few decades. More than 70% of people stated that the rainfall pattern has changed and the setting of the monsoon has shifted backwards. De Silva, 2010; stated this phenomenon is similar to the shifting of dry season and as an adverse impact of global warming and there will be less favourable environmental conditions to sustain surface water resources throughout the year. Sri Lankan marine fisheries sector will also directly affected with rising sea levels whilst the inland fisheries sector will be indirectly affected with changes in weather elements. Also it has been predicted erratic rainfall pattern can impact on agricultural land use.

Senaratne, 2014; explain climate change is a complex challenge and well-designed policies for adaptation are necessary to face the impacts of it. Further he mentioned information from different sources had indicated that five major gaps act as barriers to make effective adaptations against climate change impacts in Sri Lanka, namely: information gap, technological gap, policy and governance gap, institutional and coordination gap, and resource mobilization gap. He explained the value of reliable climate forecasts is best illustrated

in the event of cyclone Phailin, 2013 the second strongest cyclone strike to India. Improved forecasts helped the government to organize one of the largest evacuation operations saving many lives. On the other hand, a high loss of fishermen's lives due to poor communication of forecast information in Sri Lanka in June 2013 underscores the necessity of a reliable system of climate information.

III. THE STRATEGIC IMPACTS OF CLIMATE CHANGE

Naval operations in the modern globalized maritime domain are strategically important and increasingly complex. The Navy must always be ready to deploy in combat, should it come to that, but the role of naval power in peacetime has grown in both strategic importance and complexity, and naval theory needs to expand and evolve to support thorough understanding of the full range of contemporary activities (Luke, 2013). U.S. Navy, 2007; reports emphasizes maritime forces have to defend the homeland by identifying and neutralizing threats as far from with shores as possible. From fostering critical relationships overseas, to screening ships bound for ports, or rapidly responding to any threats approaching from coastline, with international partners and the private sector to provide the highest level of security possible to act against climate change. When directed, maritime forces will promptly support civil authorities in the event of an attack or natural disaster on shores.

Ranasinghe, 2013; mentioned there is a need to look beyond immediate security issues and look to the medium to longer term for major resource and environmental management issues. The security of Sea Lines of Communications is paramount important and supply chain dynamics are the key to maritime security issues which include ships, ports and choke points. Many Indian Ocean states lack the capacity for managing and protecting their maritime zones. Many external powers have significant interests in the Indian Ocean Rim including freedom of navigation. The seeds for maritime security cooperation lie in dealing with this dilemma.

A. *The Impact of Sea Level Rise*

Glacier mass changes for 2006-2100 were projected by simulating the response of a glacier model. Results for the Himalaya range between 2% gain and 29% loss to 2035; to 2100, the range of losses is

15-78% under. It is very likely that there will be a significant increase in the occurrence of future sea level extremes in some regions by 2100, with a likely increase in the early 21st century (IPCC, 2013). India and Bangladesh are with in the top five nations classified by population in coastal low-lying areas as developing and newly industrialized countries (Jongman et al. 2012). Centre for Marine Biodiversity and Conservation, 2010; report explain Bangladesh, where 112 million people live in low-lying areas vulnerable to monsoonal flooding, 17 million people could be forced to flee 22,000 square kilometres once seas raise 1.5 meters. Such refugee crises are expected around the world as rising seas inundate coastal areas, creating social instabilities that could potentially lead to conflict.

Sea level rise may also bring additional risks such as lower agricultural yields causing malnutrition along the coastal areas in the Asian region. Projected sea level rise could flood the homes of millions of people living in the low-lying areas of South Asia. The IPCC estimates that almost 60 percent of the projected increase in the annual number of people flooded in coastal populations will occur in South Asia, along the coasts from Pakistan, India, Sri Lanka, and Bangladesh through to Myanmar. The potential impacts of a 1meter sea level rise include inundation of 5,763 square kilometres in India by 2050 (Michel and Pandya, 2010).

Coastal Conservation Act of Sri Lanka, "coastal zone" is defined as the area lying within a limit of three hundred meters landward of the mean high water line and a limit of two kilometres seaward of the mean low water line. Coastal area of Sri Lanka covers 24% of the land area with 1585 kilometres of coastline growing urbanization in coastal areas with high population density, heavy dependence on sea for livelihood and high incidence of poverty make these people more vulnerable to the impacts of the climate change (Gunaratne, 2010). It is imperative to have both physical and biological barriers to curtail the coastal hazards such as cyclones, tornadoes and even tsunamis (Ranasinghe, 2012). Kalpitiya area records the highest vulnerability to sea level rise as it has the longest shoreline with a population of 81,780 of whom 44% are below the poverty line (Gunaratne, 2010).

Michel and Pandya, 2010; argue Sri Lanka has established Coast Conservation Department; nevertheless, it has found that coastal management suffers from institutional weaknesses. Further he

mentioned Sri Lanka has established national coastal zone management plan, though it lacks a sea level rise component. Individual countries of the Indian Ocean region struggle with many of the same issues; they lack a common regional policy framework for addressing their shared problems.

B. The Impact of Freshwater Resource

"Water promises to be to the 21st century what oil was to the 20th century" - New York Press. The United Nations resolutions were passed in 2010 declaring, "The human right to safe drinking water and sanitation is derived from the right to an adequate standard of living and inextricably related to the right to the highest attainable standard of physical and mental health, as well as the right to life and human dignity." 21st century and according to UNICEF statistics 783 million people do not have access to safe drinking water. Each day at least 5,000 children die from preventable water and sanitation related diseases and 85% of the world's population lives in the driest regions of the world and the varying degrees of access to clean water may resultant water conflicts (Cader, 2014).

IPCC, 2013; assessments report mentioned in many regions, changing precipitation or melting snow and ice are altering hydrological systems, affecting water resources in terms of quantity and quality. Glaciers continue to shrink almost worldwide due to climate, affecting runoff and water resources downstream. The droughts during the last millennium of greater magnitude and longer duration than those observed since the beginning of the 20th century in many regions.

Michel and Pandya, 2010; explain saline intrusion from sea level rise will degrade water quality in coastal rivers, lakes, ponds, and aquifers in different countries of the Asian region. This degradation will in turn put stress on the existing drinking water sources which is already a problem affecting Bangladesh, India, the Maldives, and Sri Lanka to varying extents. Further Global Water Partnership, 2011; report mentioned almost two-thirds of the world's population is projected to experience some kind of water-related stress and, for one billion of them, the shortage will be severe and socially disruptive.

Jeelani, 2008; observed decreases of the discharge of groundwater fed springs in Kashmir in India since the 1980s were attributed to observed precipitation decreases. Further Global Water

Partnership, 2011; report mentioned India is the world's largest user of groundwater. In regions such as North Gujarat and the large coastal aquifers of Tamil Nadu, Saurashtra and Rajasthan, over extraction have led to the collapse of agricultural economies. Asian Development Bank, 2012; report mentioned the per capita water availability in India has decreased to 1869 m³ per year from 4000 m³ in last two decades. By 2025, the per capita water availability could decrease to less than 1000 m³, indicating an extremely stressful situation.

According to Gunaratne, 2010; the Dry Zone areas of North, North East, North West particularly and South and South-central regions of the Sri Lanka are vulnerable with respect to the scarcity the drinking water. According to the estimates 36 districts will be highly vulnerable with a population of 1.76 million of which 472,995 people below the poverty line. In the highly vulnerable districts 60.5% of the populations depend on ground water.

C. The Impact of Fisheries

Mid-21st century and beyond, global marine species redistribution and marine biodiversity reduction in sensitive regions will challenge the sustained provision of fisheries productivity. Climate change adds to the threats of over fishing and other non-climatic stressors, thus complicating marine management regime (IPCC, 2013). De Silva, 2010; mentioned fishing plays a dominant role in the economy of the coastal population of the Sri Lanka. The industry provides direct employment to 1.5 million persons. In addition over 10 million people are employed in fishing related industries. It is important to highlight that the problems associated with global warming, coastal fishing production is likely to be affected with possible sea level rise and the frequent rise of sea level will destroy both coastal and offshore fish production.

Future Iqbal, 2010; mentioned coastal wetlands are susceptible to rising sea levels, saline intrusion and coastal retreat resulting in changes in habitat and species distribution. The fish stocks would be affected by temperature and sea level rise by their impacts on the distribution, growth and reproduction of fish stocks. Therefore, changes in the ocean circulation may lead to the loss of a certain population or the establishment of new ones. Gunaratne, 2010; argue these include investors and employees in the travel industry, farmers in low lying areas closer to sea, fishing community and other groups such as vendors and

land-less people who live in coasts. Of these, the fishery community in Sri Lanka may be the most important sector with respect to the climate change vulnerability.

D. The Impact of Foods Security

21st century, climate-change impacts are projected to slow down economic growth, make poverty reduction more difficult, further erode food security, and prolong existing and create new poverty traps, the latter particularly in urban areas and emerging hotspots of hunger (IPCC, 2013). Centre for Marine Biodiversity and Conservation, 2010; mentioned an increase of 1-2 degrees Celsius in global average temperature is expected to decrease agricultural production in tropical and sub-tropical regions. Iqbal, 2010; explain the impact would be widely felt during dry weather conditions with greater penetration of salt water. Salt water intrusion on low lying agriculture would degrade arable lands and significantly lower the agricultural output.

According estimates, the vulnerability of irrigation is prominent in the Dry Zone of Sri Lanka mainly due to high dependency on irrigated agriculture. Eighteen districts were found to be highly vulnerable where a total population of 0.96 million people, of whom 224,210 are below the poverty line. Thirty nine districts are in the moderately vulnerable category with a total population of 1.74 million people (Gunaratne, 2010).

E. The Impact of Human Health

21st century, climate change is expected to lead to increases in ill-health in many regions and especially in developing countries with low income, as compared to a baseline without climate change (IPCC, 2013). Centre for Marine Biodiversity and Conservation, 2010; report mentioned rising temperatures are expected to exacerbate the incidence of malaria, malnutrition, infectious diseases, cardiorespiratory disease, and other illnesses.

De Silva, 2010; explain the adverse impacts of global warming should be addressed in the health planning sector in Sri Lanka. It has been predicted that the erratic rainfall patterns particularly in the Wet zone would provide ideal breeding grounds to mosquitoes. It's reported that Dengue haemorrhagic fever has become a widespread phenomenon in Sri Lanka. On the other hand with increasing temperatures the abandoned water

bodies in the dry zone will be vulnerable to spread of Malaria.

F. The Impacts of Natural Disasters

Many global risks of climate change are concentrated in urban areas. Heat stress, extreme precipitation, inland and coastal flooding, landslides, air pollution, drought, and water scarcity pose risks in urban areas for people, assets, economies, and ecosystem. Floods larger than those recorded since 1900 occurred during the past five centuries in northern and central Europe, western Mediterranean region and eastern Asia (IPCC, 2013). Centre for Marine Biodiversity and Conservation, 2010; report mentioned heat waves have increased in frequency, intensity and duration in recent decades. Extreme heat drives up the demand for energy, sickens and kills people and livestock. Destructive storm surges, such as those seen in 2005 with Hurricane Katrina, are expected to become more common and more intense in a world with a higher sea level.

De Silva, 2010; mentioned cyclones originate with the development of low pressure centres in the Bay of Bengal. During the last 20 years in Sri Lanka the frequency of occurrence of cyclones has increased as an adverse impact of global warming. It has been predicted with the global warming impacts of Sri Lanka could experience frequent occurrence of cyclones. The occurrence of cyclones is not a common phenomenon, but past experiences show that there had been flash floods resulting from high intensity short duration rainfall associated with cyclones.

IV. THE MARITIME SECURITY CHALLENGES OF CLIMATE CHANGE

IPCC, 2013 assessment report emphasizes violent conflict may increase due to vulnerability of climate change. Large scale violent conflict harms assets that facilitate adaptation, including infrastructure, institutions, natural resources, social capital, and livelihood opportunities. National Research Council, 2011; report argues climate change alone is unlikely to cause conflict, but its manifestations can. The committee reviewed reports by the Centre for Naval Analyses and the National Intelligence Council found climate change can act as an accelerant of instability or conflict, placing a burden to respond on civilian institutions and militaries around the world and leading to potential national security implications.

Centre for Marine Biodiversity and Conservation, 2010; report mentioned the globe's changing climate is expected to environmentally stress many regions, shifting the availability of water, arable land and other natural resources in ways that potentially could cause conflicts. Many experts have said that fresh water shortages could create tensions between nations and spark conflicts around the world during this century, much as oil shaped geopolitics and war in the last century. Social Development Department, 2008; report mentioning the issue of climate change and armed conflict is characterized by two paradoxes. First, the many processes associated with global warming, which have truly started to appear only over the last fifteen years, have occurred during a time when we have witnessed a dramatic inducement in the frequency and severity of armed conflict. Second, the empirical foundation for a general relationship between resource scarcity and armed conflict is indicative at best. Several single-case analyses suggest that resource scarcity contribute to outbreak of organized violence.

Murphy, 2008; contribute maritime disorder and the threat to free movement at sea potential threats to confront all maritime users and every power that values the freedom of the seas are not only piracy or maritime terrorism alone. Participants can move between activities legal fishermen can fish illegally, illegal fishermen can be pirates, pirates can be smugglers, smugglers can move weapons and men for terrorists, terrorists can kidnap fishermen for ransom, and so on and each activity can influence and create opportunities for another, to a point that could spark conflict.

Rising seas and larger storm surges also are expected to flood many defence installations, such as Diego Garcia in the Indian Ocean, which can impair or delay operations and disrupt supply lines to the battlefield (Centre for Marine Biodiversity and Conservation, 2010). CNA Corporation, 2007 stated security concerns associated with climate change include the potential for conflict over natural resources, population displacement and migration as the result of sea-level rise or increasingly frequent of humanitarian disasters as a result of extreme climate events.

A. The Impact of Illegal, Unreported and Unregulated fishing

IPCC, 2013; assessments report mentioned large species like tuna in the Pacific and Indian oceans

are likely to move eastwards and 400 hundred million people depend critically on fish for their food and face reduced access to marine protein because of climate change and acidification. Changes in the distribution of particular marine species may lead to conflict between fishing nations and significant increases in illegal fishing.

There have been problems relating to the illegal unreported unregulated fishing activities all over the country's EEZ. Illegal and unregulated fishing activities in Sri Lankan waters have become prominent challenge and this may affect not only to the Sri Lanka security but also to the other regional countries. It's the responsibility of the Navy to safe guard fishery wealth of the country and sharing of fishery resources with neighbouring countries, for instant, the intrusion of Indian trawler fishermen in Sri Lankan waters is a huge challenge ahead of the navy (Wijegunaratne, 2012). Hence there is a high possibility that the climate change impacts on fisheries increase the vulnerability of this challenge.

B. Impact of Illegal Migrations and Human Trafficking

Climate change over the 21st century is projected to increase displacement of people. Displacement risk increases when populations that lack the resources for planned migration experience higher exposure to extreme weather events, in both rural and urban areas, particularly in developing countries with low income (IPCC, 2013). Murphy, 2008; Seaward migration will mean that the human and informational terrain of coastal waters will become crowded. The conflicts there will be fought among confusing numbers of people. Ernst & Young, Strategic business risk, 2008; mentioned recent studies distinguish between migration driven by the increasing frequency and intensity of slow onset disasters such as drought and desertification; Rapid onset disasters such as floods and cyclones, and incremental changes driven by sea-level rise.

Asian Development Bank, 2012; report mentioned only India and Sri Lanka among the South Asian countries have signed the Protocol on Human Trafficking. However they have yet to ratify it. The UN Office on Drugs and Crimes states that South Asia is home to a vast number of victims of human trafficking. Illegal drug trafficking is also a lucrative trade in the region. Environmental Resource Management, 2002; Michel and Pandya, 2010; and World Bank, 2002; reports gauging there is possibility in the Indian Ocean that unchecked

global warming could generate thousands, hundreds of thousands, even millions of climate refugees from island states and other countries as well poses tremendous political and ethical dilemmas with which the international community has barely begun to wrestle.

Nullifying drug trafficking and arm smuggling is one of surpassing security challenge which is in front of Sri Lanka Navy due to Sri Lanka's proximity to 'Golden Triangle' and 'Golden Crescent', Sri Lanka had become a major transit point for drug trafficking in to Europe and other Western countries. Also geographical location of the Sri Lanka is one of the closest reasons for rising human trafficking. In the past, many illegal asylum seekers used Thailand and Indonesia as transit points, but presently it has changed. Sri Lanka has been identified as a transit point by human smugglers (Wijegunaratne, 2012). Hence, climate change will increase the illegal migrations, human and drugs trafficking pressures near proximity of Sri Lankan water.

C. *The Impact of Piracy*

Murphy, 2008; mentioned piracy is a crime defined by geography that requires the presence of other factors, such as a permissive political environment, cultural acceptability, and the opportunity for regard, in order to flourish. Since the end of World War II such combination have occurred in only a relatively few places; around parts of Southeast Asia and in the Bay of Bengal also highlighted. If not confronted it can suppress economic activity and distort economic incentives, lower productivity by increasing security and replacement costs, erode confidence in authority, and undermine notions of justice. The range of criminal activity at sea is already large and appears to be growing. Maritime illegal activity includes arms smuggling, drug smuggling, people smuggling, toxic waste dumping, and piracy.

Maritime piracy is an expected security challenge to Sri Lanka. Even though there is no any reported piracy actions in Sri Lankan waters even there were number of incidents in Indian Ocean. Right now there is no direct impact on Sri Lanka but it affects the entire global maritime trade and thereby Sri Lanka also can be affected. Dondra traffic separation scheme can have a risk of piracy and it is the world's busiest shipping lane, and it is ideally located at the inter section of major international sea trading routes. Over 100 ships bypass Sri Lanka

daily during the voyage between Europe and Far East (Wijegunaratne, 2012). Hence climate change impacts may increase the treat of piracy in Sri Lankan water in future scenarios.

D. *Engagement in Disaster preparedness and Response*

Rising seas, extreme weather, droughts, dwindling access to fresh water and other consequences of global warming are expected to increase instability and create conflict in many regions. They could impact the ability of the armed forces to operate around the world. Many scientists see the catastrophic flooding in Pakistan in the summer of 2010 as an example of how continued warming could amplify extreme weather events around the world. Hurricanes and monsoonal effects are expected to grow more intense; droughts and wildfires more extreme and flooding more severe undermine the ability of military troops to complete their missions. Abroad, where heat waves kill thousands of people and trigger severe energy crises, nations with weak political institutions are vulnerable to internal unrest and external conflicts over resources (Centre for Marine Biodiversity and Conservation, 2010).

It has been standard practice of states around the world to use the capabilities of their armed forces, navies in particular, to address emergencies caused by natural disasters. These instances of international cooperation for disaster response operations, point to the fact that rapid response capabilities inherent in armed forces can be utilized for operations in support of civil governments. Perhaps, the aspect of disaster management where defence forces in general and navies in particular, has the most roles is on disaster response (Alano, 2010). Hence Climate change impacts will increase the engagement of naval forces for disaster preparedness and response.

V. RECOMMENDATIONS AND SUGGESTIONS FOR SRI LANKA NAVAL FORCES

The Navy is the first line of defence; Sri Lanka Naval forces are to ensure the security of the state from threats that may arise firstly from or in conjunction with the ocean and secondly from or in conjunction with other water bodies. The ocean is the highway that connects all land masses; hence it is the highway that enemy forces or citizens of other states or dangerous bio organisms, pathogens and pollutants can use in order to enter the country.

The ocean itself can transform into an enemy that threatens the nation. Therefore navy been trained in toxicology, biology, as well as in weaponry military tactics and strategy.

Sri Lanka Navy and Coast Guard to address the gaps in communications, domain awareness, search and rescue, and environmental observation and forecasting capabilities to support current and future planning and operations; which identifies climate change impacts as a strategic challenge, and defines navy strategic imperatives including the prevention or mitigation of disruptions or crises, and the fostering and sustainment of cooperative relationships with more international partners.

Sri Lanka Navy and Coast Guard need to ensure strategies, policies, and plans are informed by scientifically based climate change assessments and predictions to ensure the national security impacts of climate change. The Navy is to be fully missioned capable through changing climatic conditions while actively contributing to national requirements for addressing climate change. To maintain competency in all missions under all climatic conditions Sri Lanka Naval Forces need to conduct war games, table top exercises, and limited objective experiments that include projected climate change impacts.

Sri Lanka Navy and Coast Guard have to be trained in coastal zone management perception and mitigation of disasters associated with the ocean and other water bodies. Mitigation demands awareness and education; hence the maritime forces must be trained in pedagogical methodology which increase public awareness and knowledge of maritime hazards. Freshwater may become a hazard as its shortage may turn it into a strategic resource over which wars may be fought. The Sri Lanka Naval forces will therefore have to be trained in governance and administration so that it can ensure the systems of rationing are in place and water is distributed equitably. As the sea level rises, salt water is expected to intrude into freshwater reservoirs, particularly on neighbours' countries where inhabitants could be forced to flee their homes permanently. Strategic planners of Sri Lanka Naval forces may recognize the links between climate change and national security and should committed acting to prepare for the challenges of climate change.

Sri Lanka Naval forces need to determine what modifications, if any, of weapons, platforms, and sensors, command and control, communications, computers, intelligence, surveillance, and reconnaissance, installations and facilities are required to adapt to the effects of climate change. That ensure the naval force structure and infrastructures are delivered at the right time and right cost to meet combatant commander requirements in all potential climatic conditions. Navy needs to initiate a Naval Climate Change Adaptation Capabilities Based Assessment. This assessment will be performed in accordance with Joint Capability Integration and Development System and this will address the current and required force structure to execute missions as assessed in the Mission Analysis in view of Changing Climate.

Sri Lanka Navy needs to develop a Climate Change Strategic Communication Plan that will provide a framework within which the Navy publicly discusses the climate change. Naval forces should openly engage in public discussion to inform the media, public, government, defence, inter-agency, international audiences and other interested stakeholders regarding the Navy's policy, strategy, investments, intentions, and actions in response to climate change.

Sri Lanka Naval forces should conduct environmental assessment and prediction to understand the current environmental changes and identify with high confidence projected effects of climate change on the type, scope, and location of future Navy missions and installations and form new and expand existing cooperative agreements with joint, interagency, international, scientific and academic, and non-governmental organization partners to consider climate change assessment, prediction, and adaptation.

Sri Lanka Naval forces should conduct the assessments of potential impacts of climate change on defence installations, and adapting where necessary to preserve operational readiness and studying how the rising sea level and more intense storm surges could impact defence installations. Defence planners may understand how people behave when confronted by events connected to global climate change including extreme weather, rising seas, droughts and freshwater shortages. That will help to obtain better understand the risks for conflict and humanitarian crises that are caused

or exacerbated by climate changes in particular in home and region.

Sri Lanka Navy and Coast Guard need to be equip with robust strategic sealift, and heavy helicopter airlift capabilities comprise with rapid response units. Sri Lanka as an archipelagic and maritime nation, the sea provides the most effective medium to deliver response and relief aid. Therefore, Sri Lanka navy must maintain ships that can operate in higher levels of sea states to ensure that it can deliver response and aid in times of calamities. Naval forces should working with other nations to build capacity to respond against natural disasters. Therefore, preparedness is enhanced through the conduct of joint training exercises among regular units, reserve forces, civilian agencies, and relief organizations. Thus, capabilities and capacities for disaster response will continue to be an essence in the future development of Sri Lanka Navy.

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