



أكاديمية الإمارات الدبلوماسية  
EMIRATES DIPLOMATIC ACADEMY



## EDA INSIGHT

RESEARCH & ANALYSIS

NOVEMBER 2019

# Addressing Geo-environmental Security Challenges in the Indian Ocean Region: Setting a Regional Agenda

Dr David Brewster

**Disclaimer:** The views expressed in this publication are solely those of the author(s) and do not necessarily reflect the views of the Emirates Diplomatic Academy, an autonomous federal entity, or the UAE Government. Copyright: Emirates Diplomatic Academy 2019.

**Cover photo:** Shutterstock Photo, ID: 1351328627



**Dr David Brewster**

Senior Research Fellow, National Security College, Australian National University

Dr David Brewster is an expert on Indian Ocean and Indo-Pacific security. He is the author of *Australia's Second Sea: Facing our Multipolar Future in the Indian Ocean*. Dr Brewster is also a contributing author of a recent report: *Environmental Security in the Eastern Indian Ocean, Antarctica and the Southern Ocean: A Risk Mapping Approach*.

## Executive Summary

- ◇ The Indian Ocean region (IOR) is an epicentre for a range of natural hazards. These are increasingly being amplified by a range of climate change-related environmental security threats, many of which have potential strategic consequences.
- ◇ This Insight explores some of the key geo-environmental challenges faced by the region. It then uses three case studies to explore the complex interactions between environmental and conventional security threats.
- ◇ The UAE will head the Indian Ocean Rim Association (IORA) from October 2019 to 2021. This Insight will explore ways in which the UAE can play an important regional leadership role by establishing a regional agenda to address geo-environmental challenges.
- ◇ Potential initiatives could include:
  - o *Establishing an Indian Ocean Environmental Security Forum*: The UAE could take the lead in sponsoring the establishment of an Indian Ocean Environmental Security Forum that brings together military and civilian agencies and non-governmental organisation across the region. The objective of the forum would be to create shared understandings on environmental security threats and help establish habits of dialogue in mitigating these threats.
  - o *Enhanced regional coast guard cooperation*: The UAE could join with like-minded partners to create arrangements for dialogue, cooperation and training among Indian Ocean coastguards. This could include ongoing arrangements for professional development of senior coast guard practitioners in the region.
  - o *Disaster Risk Reduction*: The UAE could join with other key states to develop framework disaster management arrangements among key Indian Ocean states with significant capabilities in this area. Such an arrangement could focus on developing pre-existing coordination mechanisms for responding to disasters among the most capable states.
  - o *Research on fish stocks*: The UAE could promote environmental risk assessments by IORA and other relevant agencies of all species of fish in the Indian Ocean, including studies on the potential impact of climate change on these fish stocks.

## The Issue

In the coming years, the Indian Ocean will face a host of environmental security threats driven by climate change and other human activity.

These threats are significant. Moreover, they cannot be properly understood or addressed in isolation from each other. A range of environmental threats, including natural disasters, rising sea levels, extreme weather events and deteriorating fish stocks, have the potential to combine and cascade into overwhelming geo-environmental challenges that can affect the entire region in ways far beyond their individual impacts. What might initially appear to be 'merely' environmental issues can often have significant strategic consequences.

Geo-environmental challenges also often go well beyond the ability of individual states to respond and generally demand a collective response. But while the IOR may be an epicentre for many of these challenges, the region currently has few institutions that are well suited to the task of organising a response. As a first step, the region needs better mechanisms to build shared understandings among civil and military agencies and non-governmental groups about how to mitigate and contain environmental security threats.

As Chair of IORA in 2019-21, the UAE will have an opportunity to demonstrate its regional leadership and set the agenda for regional cooperation. The UAE is already demonstrating leadership in renewable energy. This Insight explores how the UAE could also consider initiatives to bring together the region to address other geo-environmental challenges.

## Growing Environmental Security Threats in the IOR

Significant disruptions in the natural environment are likely to create a range of security threats in coming years.<sup>1</sup> This section will discuss existing natural hazards faced in the IOR. It then discusses the potential impact of climate change and other human interactions on the environment and how these might create environmental security threats.

The IOR has long been an epicentre for a range of natural hazards, including climatological (cyclones and droughts), geological and tectonic (earthquakes and tsunamis) and hydrological (such as floods and tidal surges).

Along with the Pacific, the Indian Ocean experiences the most serious natural hazards in the world, but it is also one of the regions with the least capacity to respond. The impact of many natural hazards, such as cyclones, floods and earthquakes, is magnified by the relatively high population density in parts of the region. This may be further exacerbated by the growth of huge, dense, urban areas, particularly in coastal areas.

The eastern part of the Indian Ocean is also particularly prone to earthquakes, volcanoes and tsunamis. The intersection of the Eurasian and Indian and Australian tectonic plates creates a subduction zone that extends along the coast of Java, Sumatra and through the Andaman Sea. That region is particularly prone to earthquakes and tsunamis caused by undersea earthquakes and landslides, as well as volcanic activity.

These natural events have the potential to cause massive death tolls, population displacement and material and economic destruction.

The natural environment in the IOR is also significantly affected by climate change and other human interactions. This will likely act as an impact multiplier, increasing vulnerabilities caused by natural hazards, as well as exacerbating existing threats to human security, including geopolitical, socioeconomic, water, energy, food and health challenges.

Robert Glasser, former head of the UN Office of Disaster Risk Reduction, has commented that as a consequence of climate change, we may now be entering the "Era of Disasters" with profound implications for the way we organise ourselves.<sup>2</sup>

When climate impacts are combined with ethnic or other social grievances, they can contribute to increased migration, internal instability or intra-state insurgencies, and may foster terrorism or even cross-border conflict. Climate-induced resource competition can also increase tensions within and between states. In short, climate change and other geo-environmental challenges can be a significant contributor to strategic instability.

With these in view, this Insight focuses on the following key climate change-related security threats in the IOR:

- increase in severity of tropical cyclones;
- rise in sea levels; and
- decline in fish stocks and growing competition for fish resources.

### Increase in Severity of Tropical Cyclones

Tropical cyclones have historically been a major source of death and destruction across the Indian Ocean. In the Bay of Bengal in particular, tropical cyclones have routinely exacted near apocalyptic death tolls from the shallow farming and fishing settlements of the Ganges River Delta and Deccan plateaus. Although some countries such as India and Bangladesh have made great strides in building community resilience against storms, the geography of the region means that tropical cyclones remain a major threat.

There are considerable uncertainties around the potential impact of climate change on tropical cyclones. The Intergovernmental Panel on Climate Change (IPCC) states that while it is likely that overall global frequency of tropical cyclones will either decrease or remain essentially unchanged, it is more likely than not that the frequency of the most intense storms will increase substantially in some ocean basins.<sup>3</sup>

The increased frequency of intense cyclones will likely increase pressures on disaster response capabilities. Perhaps even more importantly, the occurrence of such cyclones could significantly reduce resilience in affected areas, making them more vulnerable to other environmental or human security threats.

### Rise in Sea Levels

The rise in sea levels associated with climate change could have a significant impact on many states in

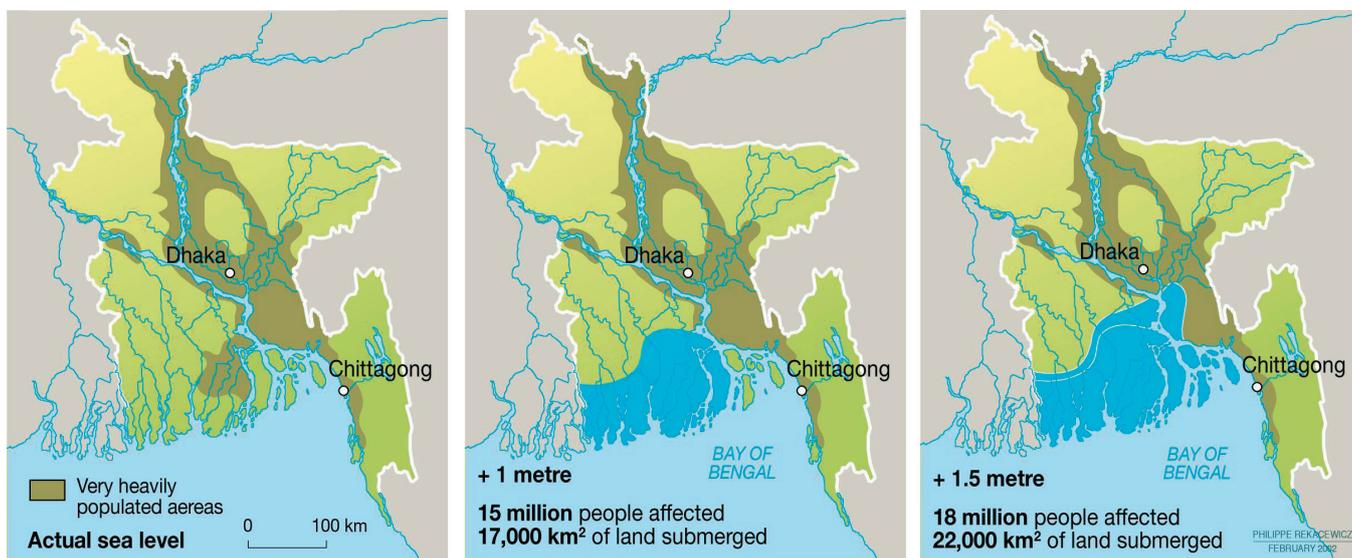
the IOR in several ways. Sea level rises would be expected to contribute to rise in the frequency and severity of flooding events, especially when combined with increases in the severity of storms and ground subsidence.

Sea-level rise is projected to aggravate storm surge, flooding, erosion and other coastal hazards, resulting in significant losses of coastal ecosystems. An increase in sea level would also be expected to cause the intrusion of seawater and salinisation of groundwater that will challenge freshwater availability and reduce soil fertility.

For island states such as the Maldives, a significant rise in sea levels when combined with the impact of waves could represent a threat to the continued existence of the country. As long ago as 1987, Maldives president Maumoon Gayoom told the United Nations General Assembly that a rise of 2 metres above mean sea level would virtually submerge the entire country and that a mere 1 metre rise could also be catastrophic, and possibly fatal to the nation. With some 99% of tourist accommodation within 100 metres of the ocean, any significant rise in sea levels may effectively destroy the Maldives' most profitable industry even before it renders the country uninhabitable.<sup>4</sup>

Sea level rises could also have a dramatic and large-scale impact on Bangladesh, particularly when combined with storm surges. According to the Global Military Advisory Council on Climate Change,<sup>5</sup> a 1 metre rise in sea level would inundate around 17% of Bangladesh's land area, directly affecting around 15 million people, and a 1.5 metre rise would affect around 18 million people.

**Figure 1: Impact of Sea Level Rise in Bangladesh**



Source: Global Military Advisory Council on Climate Change and Security in South Asia, GMACC, May 2016.

The Bangladesh Government estimates that some 20 million people will be displaced by climate change in that country, while other studies go as high as 30–35 million people.<sup>6</sup> Increased salinity of land would also lead to reduced agricultural production.

But the consequences of climate change-related population displacement, and the mechanisms of how such displacement might impact on regional security, are not yet clear. According to the IPCC, it is widely established that extreme weather events displace populations in the short term because of their loss of place of residence or economic disruption. However, only a proportion of displacement leads to more permanent migration.<sup>7</sup>

The United Nations International Strategy for Disaster Reduction states that “due to the multidimensional and complex dynamics of migration and displacement, quantitative projections of future trends have low confidence levels, even though there is agreement that climate change will drive future displacement and patterns of movement.”<sup>8</sup>

However, as discussed later, there is already persuasive evidence that large scale population displacement caused by drought was a significant contributing factor in the Syrian civil war. That conflict has caused considerable strategic instability throughout the region. Similar consequences could easily arise from large-scale population displacement caused by sea level rise.

### ***Decline in Fish Stocks and Growing Competition for Fish Resources***

Another significant environmental security challenge could arise from a significant decline in fish stocks across the Indian Ocean. This could occur through a combination of factors, including:

- overfishing by local and extra-regional fishers, acting both legally and illegally; and
- climate change-related changes in the marine environment, including acidification, marine heatwaves and hypoxic areas, as well as marine pollution.

Many states in the Indian Ocean rely heavily on fish as a source of income and as a major source of animal protein. According to the Food and Agriculture Organisation (FAO), fish contributed to 54% of total animal protein in Indonesia, with Bangladesh at 56% and Sri Lanka at 57%.<sup>9</sup>

Fishing is also a major contributor to employment. For example, according to 2014 statistics, the Bay of Bengal fishery provided food for approximately 400 million people, with 2.2 million fishers providing a livelihood for 4.5 million people.<sup>10</sup> The decline in sustainable fish stocks is therefore a major problem for economic and food security.

The threat to fish stocks comes from overexploitation from legal as well as illegal, unreported and unregulated (IUU) fishing, by both local and extra-regional fishers. The FAO estimates that 90% of the commercial fish stocks it tracks worldwide have been overfished or fully fished, with estimates of the proportion of illegal catch to reported catch in the Indian Ocean among the highest in any region of the world.<sup>11</sup>

The problem of IUU fishing will likely grow, driven by growing population, falling fish stocks and relatively weak enforcement arrangements. Extra-regional states such as Spain, Taiwan, Japan and Uruguay have long been active fishers in the Indian Ocean and they are now being joined and surpassed by China. The decline of fish stocks in Chinese waters and growing demand for fish protein has led the Chinese government to build a subsidised fishing industry to operate far from Chinese waters. The World Bank estimates that China will account for some 37% of the global catch by 2030, many times that of any other country.<sup>12</sup>

Significant declines in fish stocks from overfishing may be exacerbated, perhaps in unpredictable ways, by climate change and other human impacts. This includes changes to oceanic currents, the occurrence of marine heatwaves, ocean acidification, the development of hypoxic areas where normal oxygen levels are depleted, and marine pollution. The Indian Ocean is reportedly the second most polluted ocean in the world.<sup>13</sup> Ocean pollution results from waste from the general population, agricultural activities, shipping and transportation, ocean exploration and other industries.<sup>14</sup> Marine pollution contributes to the destruction of marine habitats, loss of fish stocks and the bleaching of coral reefs.

Despite concerns about the sustainability of Indian Ocean fisheries, there is currently insufficient data to properly assess the risks. Data is currently collated by the Indian Ocean Tuna Commission and national agencies, principally for the purpose of the allocation of quotas rather than as an environmental security risk assessment. One recent study argued that actual fish catches in the eastern Indian Ocean over the last 60 years have been much higher than those reported by the FAO, and that catches are currently declining at a much higher rate than is generally believed.<sup>15</sup>

For countries that rely on fish for income and protein, the decline in resources could contribute towards economic dislocation/decline in living standards, violent extremism, political instability and potentially even large-scale population movements out of certain areas that are reliant on fishing.

A 2013 report by the US National Intelligence Council found that stresses in Indian Ocean fisheries might undermine the internal stability of countries such as Bangladesh, as well as bilateral and regional relations such as those of India–Bangladesh, India–Pakistan and India–Sri Lanka as fishing becomes an ever more contested activity.<sup>16</sup>

An intensification of competition for fish resources could create security threats in a variety of ways, including through the interaction of regional and extra-regional fishers, national agencies, and non-state actors.<sup>17</sup> Competition over resources will, for example, likely put states under greater pressure to assert claims over and to police their exclusive economic zones (EEZ) against other fishers.

Competition for fish resources may also become a security issue in relationships with extra-regional powers.<sup>18</sup> Elsewhere, illegal fishers have used force to prevent interventions by local enforcement agencies, and extra-regional fishers could increasingly seek protection from their own governments. Contests between state agencies over access to fishing resources may increasingly meld into grey zone operations in the maritime domain.<sup>19</sup>

Future fishing disputes may also increasingly involve other non-state actors. In the western Indian Ocean, there has been growing use of armed private security contractors on fishing boats. Fishing enforcement disputes also increasingly involve NGOs such as Sea Shepherd, which has worked with local authorities to catch IUU fishers in Gabon, Tanzania, and Timor Leste. The presence of NGOs could substantially complicate fishing-related disputes.

## Interaction of Geo-environmental Challenges and Security

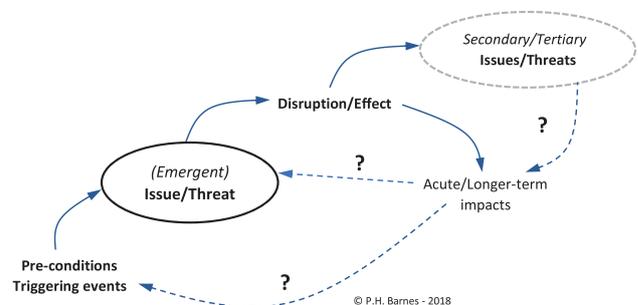
The previous section explained why the incidence and severity of environmental disruptions in the IOR will likely grow in coming years. But, importantly, these environmental disruptions cannot be properly understood in isolation from each other, or in isolation from so-called ‘traditional’ security threats.

In practice many disruptions to the natural environment have the potential to go far beyond what are normally understood as discrete environmental challenges. Rather, we should understand them as ‘geo-environmental’ challenges, on par with geopolitical challenges in terms of their potential to become a significant disruption to the strategic order of the region.

### Cascading and Compounding Events

Environmental disruptions often do not occur as isolated events, but instead can occur in combination or as a cascading or compounding series of events. One environmental disruption can contribute to or exacerbate the occurrence of another. Or one event might significantly reduce our resilience or our ability to respond to subsequent, unrelated, events. This potential for magnification or cascading influences can make it difficult to predict the consequences of what may individually appear to be moderate or manageable threats. This cascading influence effect is illustrated below.

Figure 2: Cascading/Compounding Effects



Source: P.H. Barnes - 2018

Climate change, in particular, could lead to the cascading/compounding of natural hazards.<sup>20</sup> What may begin as a discrete ‘natural’ hazard can also combine with industrial accidents to significantly magnify their normal individual impacts. For example, cyclones or storm surges could trigger accidents in petrochemical plants or nuclear power plants that are often located in coastal areas.

The potential for concurrent or cascading impacts was seen in the 2011 Great East Japan Earthquake. The earthquake caused immediate major devastation in many parts of Japan, but also generated tsunamis that then further devastated coastal areas. These events combined to cause the meltdown of the Fukushima nuclear facility north of Tokyo after the earthquake shut down the electricity grid and the tsunami then disabled

back-up generators and pumps. The nuclear accident in turn led to the long-term evacuation of large areas of Japan – and a long-term move by Japan away from nuclear energy, which itself has considerable strategic implications.

Environmental disruptions in the Indian Ocean can also be complicated by other factors. The high population density of parts of the region and the location of many large cities on the coast can magnify the impact of maritime-related disruptions. Threats and disruptions in the maritime domain also tend to be more international in nature than those that occur on land. Many environmental threats occur outside of national jurisdictions. Even where maritime-related disruptions initially occur within national EEZs or national waters, they will likely have interrelated impacts elsewhere. This will require a regional response.

In the IOR, the interaction of environmental disruptions is further complicated by pre-existing strategic instability. The potential interaction of geo-environmental challenges and strategic and security threats is demonstrated by the following case studies.

### **Case Study 1: The Impact of Somali Fish Stocks on the Strategic Balance in the western Indian Ocean**

The problem of Somali-based piracy over the last 20 years illustrates the complex interrelationship between non-traditional and traditional security threats. In this case, the degradation of fish stocks ultimately being an important contributor to major power competition in the region.

One of the consequences of the collapse of the Somali state in the 1990s was the cessation of enforcement of national laws on land and at sea. This failure in governance led to the severe degradation of the rich fishing grounds off the Somali coast through the failure to prevent overfishing by IUU fishers, many of them from outside the region. This had a major impact on the food and economic security of many local communities that were almost entirely dependent on fishing. Many Somali fisherman, in search of new forms of livelihood, turned to piracy to exact ‘tolls’ from the busy international shipping routes just off the Somali coast.<sup>21</sup>

The growth of Somali-based piracy had a significant and lasting impact on regional security. For one thing, the

threat of piracy against international trade prompted an international military response, including the deployment of high-end naval vessels into the western Indian Ocean from many countries inside and outside the region.

But despite the reduction of piracy over the last several years, many countries continue to maintain a regular naval presence in the western Indian Ocean. The presence of large numbers of extra-regional naval vessels has had a long-term impact on the regional balance of power including, for example, justifying the establishment of naval support facilities by China in Djibouti.

The piracy threat also spurred the widespread use of military personnel and private security contractors aboard commercial vessels. This has had its own consequences for regional security, including the advent of private floating armouries in the northwest Indian Ocean.

It is possible that some of these consequences may have been different if the region had addressed the piracy issue in an alternative way. Early intervention by the region against IUU fishing might have mitigated the problem. It is also possible that if piracy had been addressed as primarily a law enforcement issue rather than a military issue, then its overall strategic impact on the region might have been lessened.

### **Case Study 2: The Role of Drought/Climate Change in Causing the Syrian Civil War**

As previously noted, large scale population movements related to climate change can have significant strategic impacts, even if we do not fully understand how the potential mechanisms may occur.

Some analysts argue that climate change played a key role in escalating 2011 civil protests in Syria into its long-running civil war. They argue that a multi-year drought possibly associated with climate change caused mass migration from the countryside to the cities and sparked an anti-government uprising. But here, the links between environmental and security threats are less direct compared with the Somalia-based piracy, and the mechanisms more uncertain.

Between 2006 and 2011 Syria experienced a severe multi-season drought that left farmers particularly vulnerable. Drought, and environmental degradation

through unsustainable land use and mismanagement of water resources, was further exacerbated by Syrian government policies. A 2008 US diplomatic cable (unverified, published by Wikileaks) described the drought as a 'perfect storm' when combined with other economic and social pressures. The cable commented that population displacements 'could act as a multiplier on social and economic pressures already at play and undermine stability in Syria.'<sup>22</sup>

By 2011, around 2-3 million people were suffering from significant food and economic security threats, leading to the displacement of around 1.5 million people from agricultural areas to major cities.<sup>23</sup>

Some believe that the Syrian regime's failure to put in place economic measures to alleviate the effects of drought was a critical driver in propelling massive mobilizations of dissent against the government in urban areas. Indeed, protests against the government began in the urban areas most affected by population displacement from the drought.

But while there is consensus among analysts that climatic conditions played an important role in the deterioration of Syria's economy, the Syrian civil war was also a culmination of several interconnected factors that had been developing over a long period. While there was a temporal correlation, causation is difficult to prove. In any event, most analysts agree that the drought in one way or another was a significant contribution to dissatisfaction with the government which developed into a civil war.<sup>24</sup>

### Case Study 3: The Strategic Impact of the 2004 Indian Ocean Tsunami

The security consequences of natural disasters can also be highly unpredictable. The differing security impacts of the 2004 Indian Ocean Tsunami provide an illustration of a variety of strategic consequences for the region of what may appear to be just a 'natural' disaster.

The Indian Ocean Tsunami that occurred in December 2004 was a consequence of a major undersea earthquake off the coast of Sumatra, Indonesia. This generated waves up to 30 metres high which led to the deaths of around 227,000 people in 14 countries, especially in Indonesia, Sri Lanka, India, the Maldives and Thailand.

The death and disruption caused by the Tsunami had a significant security impact in several countries. At that time in Sri Lanka, a tenuous truce existed between government and insurgent forces, led by the Liberation

Tigers of Tamil Eelam (LTTE), in the country's long-running civil conflict. Following the Tsunami, the LTTE used the opportunities presented by the chaos and inflow of economic aid to rearm and resume their insurgency. The flood of post-war Tsunami aid money, and the LTTE's control of portions of northern and eastern Sri Lanka meant they could dictate terms to aid agencies.

According to some reports, tens of millions of dollars of aid was diverted to acquire weapons to use against government forces.<sup>25</sup> The resumption of the civil conflict following the Tsunami led to a further 30,000 deaths over the next 3 years, and ultimately resulted in the defeat of the insurgency.

In the Maldives, the Tsunami also caused major economic damage and considerable internal displacement. This may have been an important factor in radicalising many local communities with continuing implications for the region. According to a report, the Tsunami was, "... a turning point in Maldivian religious beliefs, largely due to the fact that many of the clerics used it to convince people that it was God's wrath wreaked upon them for not practicing the right Islam and straying from the path of Allah."<sup>26</sup>

In the aftermath of the Tsunami, Pakistan-based jihadist groups such as Lashkar-e-Toiba (LeT) also exploited existing social fault lines through its charitable front organisation to establish a foothold especially in southern Maldives in the garb of relief operations.<sup>27</sup> The full long-term consequences of this are yet to be seen.

But in Indonesia, the security and strategic consequences of the Tsunami were quite different, and in many ways unexpected. Indonesia, which experienced around 160,000 deaths, mostly in Aceh province, which was the hardest hit in the country. The devastation of Aceh province, including the massive death toll, significantly weakened a long-running separatist insurgency. Immediately after the Tsunami, the local insurgent group, the Free Aceh Movement (GAM), declared a unilateral ceasefire, which was transformed into a permanent peace agreement with the Indonesian government the following year.<sup>28</sup>

The Tsunami also destroyed most of the boats used by local pirates (many of them associated with the insurgency), which is also believed to have been an important factor in the significant decline in piracy in the Malacca Strait.<sup>29</sup>

The 2004 Tsunami also had an unexpected, long term, impact on strategic dynamics of the Indo-Pacific region. The US, Australian, Japanese and Indian navies were at the forefront in providing relief to countries in the

eastern Indian Ocean, and their ad hoc cooperation as part of the 'Tsunami Core Group' later evolved into the so-called 'Quadrilateral' security grouping among those countries.<sup>30</sup> The 'Quad' has now become an important factor in the regional strategic balance.

China's failure to play a significant role in international relief efforts in natural disasters such as the 2004 Tsunami (and later Typhoon Haiyan in the Philippines in 2013), also led to a greater understanding in Beijing of HADR operations as an important form of soft power.

## Responding to Geo-environmental Challenges in the Indian Ocean

The rise of Somali-based piracy, climate change and the Syrian civil war, and the disparate impacts of the 2004 Tsunami all provide illustrations of how what might initially appear to be a single disruption to the natural environment could have significant, widespread, and sometimes unexpected strategic consequences for the region. Significantly, environmental disruptions usually do not occur as isolated events, but can occur in combination or as a cascading or compounding series of events.

The likely growth in the incidence and severity of environmental disruptions in the Indian Ocean in coming years, particularly due to climate change, has the potential to create major geo-environmental challenges for the region. The nature of these challenges will often require a collective response, either through existing regional groupings or new regional arrangements.

The IOR suffers from considerable regional governance deficits. The region currently has relatively few and weak mechanisms to promote cooperation in respect of geo-political or geo-environmental challenges. IORA has long been perceived to 'punch below its weight', although the recent establishment by IORA of Working Groups on Maritime Safety and Security and Disaster Risk Reduction could help with some of these issues.

However, there is no forum or grouping within the region devoted to creating shared understandings among civil and military agencies and non-governmental groups in respect of environmental security threats. This means that these agencies and groups struggle to build a collective response. This contrasts with the Pacific, where the US-sponsored Pacific Environmental Security Forum provides a useful mechanism for cooperation.

Nor is there any mechanism for regional cooperation among agencies such as coast guards, that are often

on the front line of many environmental security challenges. Coast guards are often the first responders to environmental threats in the maritime domain, including severe weather events, sea level rise and illegal fishing. The nature of the maritime domain also makes regional cooperation among maritime law enforcement and safety agencies vital. Their status as civilian law enforcement agencies often allow them to cooperate with partners and in ways that would be politically difficult for navies.

The Heads of Asian Coast Guard Agencies Meeting (HACGAM) is a grouping that brings together Asian coast guards for the whole region between Japan and Turkey. However, there is currently no network devoted to coordinating coast guards and building their capabilities in the Indian Ocean, including East Africa and the Indian Ocean island states.

Nor are there any established regional frameworks that bring together key Indian Ocean states that possess the greatest disaster response capabilities. In the Pacific islands, for example, countries such as Australia, New Zealand and France, have developed coordination mechanisms to facilitate the fast response to disasters in island states.

Finally, although there are many reasons to believe that fish stocks could come under significant threat from climate change, little regional research has been conducted on this vital question.

## Conclusion and Recommendations

The UAE can play an important leadership role in helping to set the regional agenda to address the geo-environmental challenges. The UAE becoming the chairman of the IORA provides an opportunity for the country to pursue ground-breaking initiatives either through the IORA or through regional initiatives that run alongside that grouping.

The UAE could consider pursuing the following regional initiatives:

- Indian Ocean Environmental Security Forum: The UAE could join with other like-minded countries to establish an Indian Ocean Environmental Security Forum. An Indian Ocean forum would bring together representatives from military and civilian agencies and non-governmental organisation across the Indian Ocean region to create shared understandings on environmental security threats and help establish habits of dialogue in the field of environmental security.

- **Regional Coast Guard Cooperation:** There is currently no mechanism for cooperation among coast guards of the Indian Ocean. The UAE could join with like-minded partners to create arrangements for dialogue, cooperation and training among Indian Ocean coastguards in the western Indian Ocean. This could include ongoing arrangements for professional development of coastguard practitioners.
- **Disaster Risk Reduction:** There is considerable scope for developing framework disaster management arrangements among key Indian Ocean states. Such an arrangement could focus on developing pre-existing coordination mechanisms for responding to disasters among the most capable states.
- **Research on Fish Stocks:** The IORA and/or other relevant agencies could undertake environmental risk assessments of all species of fish in the Indian Ocean, including studies on the potential impact of climate change on those fish stocks.

Any action by the UAE on initiatives such as these or on other issues that address geo-environmental challenges could be an important way of demonstrating regional leadership.

## Endnotes

1. See generally, Bergin, A, Gemenne, F, Brewster, D, and Barnes, P., *Environmental security in the eastern Indian Ocean, Antarctica and the Southern Ocean: A risk mapping approach*, National Security College, May 2019.
2. Glasser, R., *Preparing for the era of disasters*, ASPI Special Report, March 2019.
3. Intergovernmental Panel on Climate Change, *Managing the risks of extreme events and disasters to advance climate change Adaptation*, 2012, Chapter 9.
4. Chaturvedi S. & Sakhuja V., *Climate change and the Bay of Bengal: evolving geographies of fear and hope*, ISEAS, 2015, p.156.
5. Global Military Advisory Council on Climate Change, *Climate change & security in South Asia*, GMACCC paper no. 2, May 2016.
6. Ibid.
7. IPCC AR5 Climate Change 2014: Impacts, Adaptation, and Vulnerability, Chapter 12 – Human Security.
8. UNISDR, *Global assessment report on disaster risk reduction 2015*, p.107.
9. Food and Agriculture Organisation, *State of world fisheries and aquaculture 2014*.
10. Hermes, R. and O'Brien, C. 'Fish and fisheries of the Bay of Bengal large marine ecosystem' 3rd Global LME Conference Swakopmund, Namibia, 2014.
11. Agnew D., et al., 'Estimating the worldwide extent of illegal fishing', *PLoS ONE*, 2009, 4(2).
12. World Bank, *Fish to 2030: prospects for fisheries and aquaculture*, 2013.
13. 'Indian Ocean second-most polluted in the world,' *Northglen News*, 2 June 2016.
14. Hardesty, B., et al. 'Estimating quantities and sources of marine debris on a continental scale' *Frontiers in Ecology & Evolution* Vol 15 2016; J Jambeck et al, 'Plastic waste inputs from land into the ocean' *Science*, 13 February 2015, 3.
15. Pauly, D. and Zeller, D., 'Catch reconstructions reveal that global marine fisheries catches are higher than reported and declining' *Nature Communications*, 2016, Issue 7.
16. Office of the Director of National Intelligence, *The future of Indian Ocean and South China sea fisheries: implications for the United States*, National Intelligence Council Report NICR 2013–38, 30 July 2013.
17. Rumley, D., 'A policy framework for fisheries conflicts in the Indian Ocean' in D Rumley, S Chaturvedi and V Sakhuja, eds, *Fisheries exploitation in the Indian Ocean: threats and opportunities*, 2009.
18. Brewster, D., 'Chinese fishing fleet a security issue for Australia,' *Lowy Interpreter*, 17 November 2018.
19. Goldrick, J., *Grey zone operations and the maritime domain*, ASPI Special Report, 30 October 2018.
20. Glasser, R., *Preparing for the Era of Disasters*, ASPI Special Report, March 2019.
21. "Somali Perspectives on Piracy and Illegal Fishing" *Oceans Beyond Piracy*, <http://oceansbeyondpiracy.org/publications/somali-perspectives-piracy-and-illegal-fishing>; and M Sow, *Piracy and illegal fishing in Somalia*, Brookings Institution, 12 April 2017.
22. [https://wikileaks.org/plusd/cables/08DAMASCUS847\\_a.html](https://wikileaks.org/plusd/cables/08DAMASCUS847_a.html)
23. Gleick, Peter, 'Water, Drought, Climate Change, and Conflict in Syria,' *Weather, Climate and Society*, Vol.6 (2014), p.331.
24. Eklund, L. and Thompson, D., 'Is Syria really a 'climate war'? We examined the links between drought, migration and conflict' *The Conversation*, 21 July 2017.
25. Hull, B., 'Tale of war and peace in the 2004 tsunami,' *Reuters*, 18 December 2009.
26. Maldivian Democracy Network, "Preliminary Assessment of Radicalisation in the Maldives" 2016. <http://mdn.mv/wp-content/uploads/2016/09/Preliminary-Assessment-of-Radicalisation-in-the-Maldives-Final.pdf>
27. Manoharan, N., 'Divergent Maldives: too close for comfort', *Deccan Herald*, 4 September 2018. <https://www.deccanherald.com/opinion/perspective/divergent-maldives-too-close-691129.html>
28. Aspinall, Edward, *Islam and Nation: Separatist Rebellion in Aceh, Indonesia*. Singapore: National University of Singapore Press, 2009.
29. Burton, J., 'Piracy in Aceh waters ceases after tsunami', *Financial Times*, 6 January 2005.
30. Madan, T., 'The Rise, Fall, and Rebirth of the 'Quad'', *War on the Rocks*, 16 November 2017. <https://warontherocks.com/2017/11/rise-fall-rebirth-quad/>

