# CLIMATE SECURITY AND THE STRATEGIC ENERGY PATHWAY IN SOUTHEAST ASIA

PART OF THE "WORLD CLIMATE AND SECURITY REPORT 2020" BRIEFER SERIES

**A Product of the Expert Group of the**
**INTERNATIONAL MILITARY COUNCIL ON CLIMATE AND SECURITY**

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Cover Photo:
GUIUAN, Eastern Samar, Republic of the Philippines (Nov. 15, 2013) Sailors and Philippine Army soldiers help a woman onto a HC-130 Hercules from Marine Wing Support Squadron (MWSS) 172 to be airlifted to a safer location.[1]

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# EXECUTIVE SUMMARY AND KEY RECOMMENDATIONS

Climate change impacts are becoming more extreme in Southeast Asia, and their destructive power threatens national security and regional stability, as well as economies, infrastructure and populations. Storms, floods, droughts, heat waves, sea level rise and other stressors can amplify existing security challenges or create new ones, by changing resource dynamics, driving human mobility and health issues, increasing tensions within and between societies and governments, and influencing geostrategic tensions in the region. This is a concern for militaries, as climate change can impair readiness, making mission performance more difficult, even while it increases demand for humanitarian assistance and disaster response, fisheries protection, and potentially other missions. Addressing these risks will require reversing the region's tendency to embrace older technologies that perpetuate fossil fuel dependence, and making significant investments in climate resilience. Specific recommendations for military and security actors, regional governments and national energy officials offer guidance on how to systematically address climate security risks and proactively prevent existing tensions from escalating.

Key recommendations include:

- ***Military and other security actors*** **should incorporate climate change projections and predictable cascading effects into security planning, training and operations in a holistic and systematic manner,** including by:
  - Establishing "Climate Security Watch Centers"[2] to collect information and intelligence, perform analyses and make recommendations to policy-makers.
  - Conducting regular joint exercises to improve readiness for disaster response, achieving other common objectives such as enforcing the Law of the Sea, and taking advantage of experience-sharing from expert groups such as the International Military Council on Climate and Security[3] to accelerate practical application of such goals.

- ***Regional governments*** **should assess and manage climate security risks and the climate-energy-security nexus at national and regional level,** including by:
  - Leveraging ASEAN platforms to coordinate data-sharing, planning, funding and emergency response.
  - Taking the strategic steps of assessing climate change impacts on existing security stress points; improving conflict management capabilities, particularly for sub-national conflicts where interests may be partially met by social and economic development; and focusing on prevention.

- ***National energy officials*** **should take similar steps to incorporate climate security threats into energy development policy,** including:
  - Instituting a carbon emissions drawdown plan for each ASEAN Member State energy economy.
  - Assessing current and planned energy sites for climate vulnerabilities, to ensure long-term viability.

# INTRODUCTION

Climate change threatens not only human well-being and the economy of Southeast Asia, but also sub-national, national and regional security. Climate change-related stresses will likely make Southeast Asia's security issues, including multidimensional geopolitical tensions, contested maritime boundaries and competition for ocean-based resources like fish and hydrocarbons, more difficult to manage. Threats from domestic insurgent groups, violent extremist organizations (VEOs), and piracy in the Strait of Malacca and broader South China Sea may become more pressing due to the climate-related degradation of licit livelihoods. Rising sea levels and intensifying storms will increase pressures on urban governance and economic growth, and significantly add to the costs of disaster response and resilience.

Within states, climate change effects will hamper governments' abilities to meet demands for basic services, such as disaster response and food, energy and water security. This will likely degrade human security and the social compact between citizens and their governments. Looking outside their borders, Southeast Asian countries walk a delicate balance amid increasing regional geopolitical competition. Therefore, it is important to understand how the broader impacts of a changing climate might influence military power projection, alliances and partnerships, infrastructure investments, and many other national and regional security interests.

This report assesses how these threats are emerging and might accelerate, and how governments should respond in order to minimize the potential of climate change to destabilize regional security and prosperity. These include recommendations in the domains of sub-national, national and regional security, environmental management, diplomacy and energy investment decisions.

The COVID-19 pandemic has underscored the profound impact transnational threats can have on political and security dynamics. As the Indo-Pacific region marks a year of battling COVID-19, it must consider lessons learned as it faces the global crisis of climate change. Both pandemics such as COVID-19 and climate change are serious, non-linear threats to human health and the infrastructure and systems upon which societies are built. Both disproportionately affect vulnerable populations. And while technologies and strategies to blunt the impact of both exist, they have not been deployed at scale, because the incentives for optimizing short-term financial outcomes have dominated decision-making. In terms of climate change, the negative outcome of under-investment in renewable energy, climate-resilient building codes, upgrading utilities, large-scale cooling and seawalls is increasingly predictable – especially in Southeast Asia, where developing economies struggle to protect some of the world's most climate-vulnerable populations.

For the purposes of this analysis, *climate security* means the impact of climate change on the key levers of national and international security. These include direct, physical impacts on fundamental societal support systems, such as power plants and water treatment plants, and important agricultural lands – particularly when such impacts impair the ability of governments to provide essential resources or services. They also include heightened threats to state security, such as extremist or other separatist groups taking advantage of climate change-related strife to further their causes. A third category is indirect impacts which impinge on security and stability, as when melting glaciers or climate-induced demand for hydropower deplete water available to downstream communities for agriculture, energy, transport, food and commercial use, increasing tensions and frictions that become more difficult to manage nonviolently.

Finally, climate change is also a military issue. It is altering the global security environment in significant ways. It can adversely impact military readiness by physically damaging military ports, airports, infrastructure and equipment, or by impacting the physical ability of soldiers, sailors, and air service members to perform their duties. Moreover, climate hazards expand the scope of military operations, most notably but not exclusively with the growing number of Humanitarian Assistance / Disaster Response (HA/DR) missions necessary to rescue domestic or allied populations from climate-induced natural disasters and provide disaster recovery and resilience.

# CLIMATE HAZARDS AND VULNERABILITY

Climate change impacts on Southeast Asia will pose major challenges to the region's coping capacities, despite countries' existing disaster resilience expertise and relatively high economic development levels. Scientific projections show that climate change will increase the intensity of storms, raise sea levels significantly, cause coastal inundation and saltwater intrusion, and increase the number and temperature of very hot days. The implications for coastal communities and cities are concerning and will affect health, livelihoods, migration patterns and local and regional economies. Climate change threatens food and water security, and the livelihoods and economies centered around agriculture and fishing. The scale and pace of these changes may prove difficult to manage, and could lead to grievances, increased competition, disruptions, and instability with implications for local, national and regional security. This section briefly explores these climate security threats.

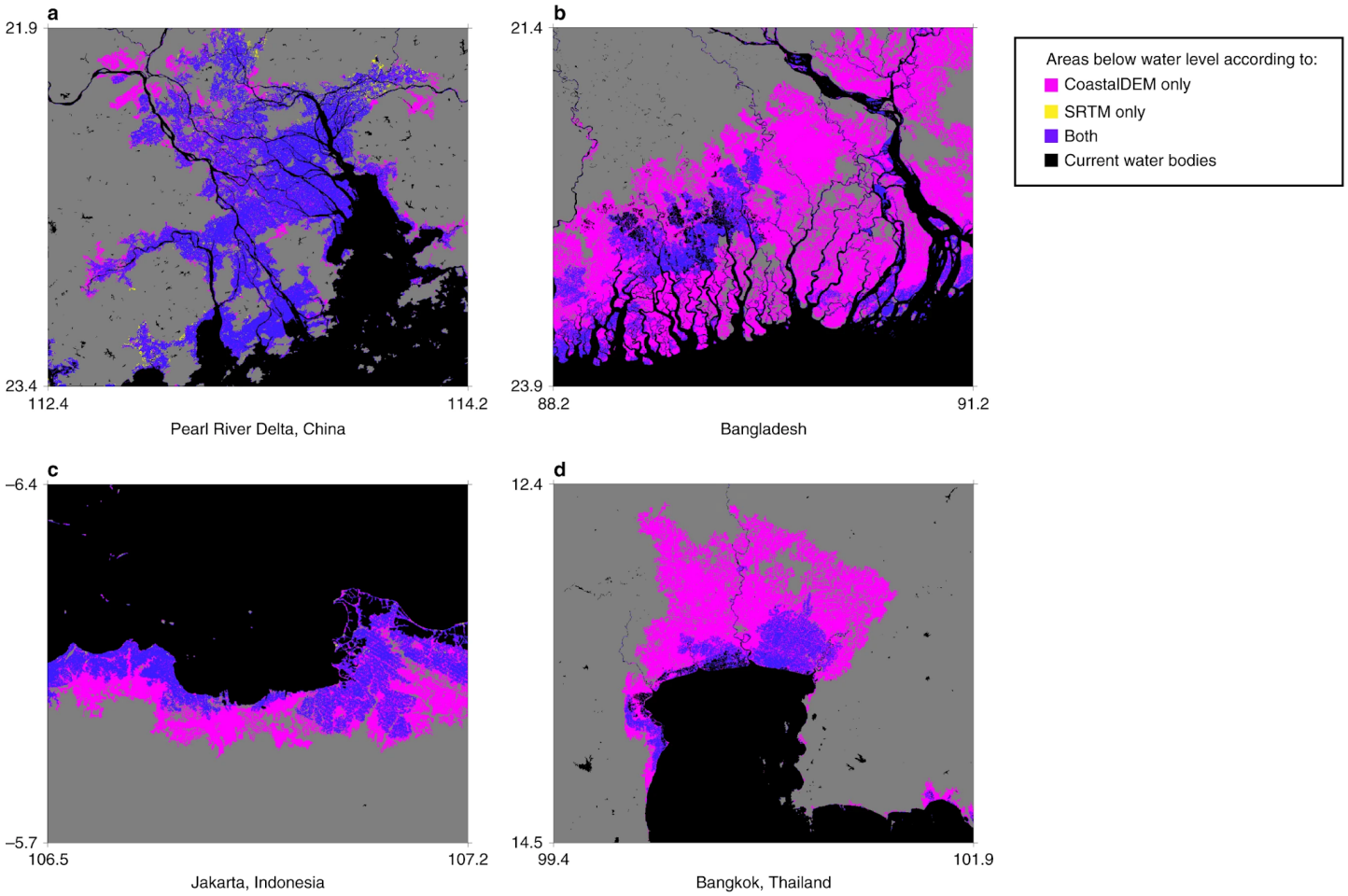
The region is highly vulnerable to climate *hazards*, such as storms, floods, heat, sea level rise, and ocean acidification which can imperil marine life. When these hazards affect significant populations or economic activity, they lead to serious climate *exposure*. If the populations are poorly equipped to cope or adapt, this results in a high degree of climate *vulnerability*. Combining hazards, exposure, and ability to cope illustrates the extent of climate vulnerability. Assessments indicate that a major portion of populated Southeast Asia, especially its low-lying coastal regions and multitude of small islands, suffer from high climate vulnerability (Image 1).

## SEA LEVEL RISE

Projected sea level rise, exacerbated by subsidence, threatens coastal and deltaic settlements across Southeast Asia, including capital megacities like Bangkok,[4] Jakarta, and Ho Chi Minh City,[5] all of which are likely to struggle to manage these threats. Regional economic infrastructure and activities are concentrated on coasts, including tourism and trade transport infrastructure. Flooding, storm surge and coastal inundation in Southeast Asia's densely populated coasts will prove economically disruptive and threaten lives and livelihoods, particularly as higher sea levels increase the destructive power and lethality of storms. This adds to numerous challenges, including in meeting the demand for humanitarian assistance and disaster response (HA/DR) and disaster resilience. Low-lying delta regions such as the Mekong, whose agriculture and aquaculture support Vietnam's food security and economy, will continue to be flooded and salinated by rising seas. Given these megacities' importance for the economies and stability of their countries, their extreme vulnerability to sea level rise could have impacts far beyond the city limits, potentially contributing to social and political instability.

Furthermore, scientists have determined that even if emissions were cut quickly and dramatically, sea level rise is likely to continue for centuries, given the warming that has already occurred.[6] Recent analysis of both coastal elevation and projected sea level rise indicate that many of the estimates currently in use may be overly conservative. New studies (see Image 1) have tripled previous estimates of vulnerability to sea level rise and coastal inundation, by reexamining land elevation.[7] Separately, projected water levels have also been revised upwards, with studies finding that ice sheet melt may drive far higher sea levels over the coming decades. Some models project up to 2.5m rise by the end of the century.[8] The combination of sea level rise, subsidence due to over-extraction of water, and extreme weather could easily overwhelm economic and governance capacity in Southeast Asia's coastal cities and deltas. How well countries are able to navigate these broader challenges could impact human development, political stability, and the wider security picture in the region.

Image 1: Areas Projected to be Permanently Inundated by Sea Level Rise by 2100




Coastal flooding simulation for Bangkok, Jakarta, Bangladesh and the Pearl River Delta, indicating land projected to be permanently inundated by 2100, using the new digital elevation model CoastalDEM and the median K17/RCP 8.5/2100 sea-level projection. Source: Kulp, S.A., Strauss, B.H. New elevation data triple estimates of global vulnerability to sea-level rise and coastal flooding. Nature Communications 10, 4844 (2019) https://doi.org/10.1038/s41467-019-12808-z.

In addition to human security and economic growth, sea level rise will affect coastal military installations and infrastructure. It will likely complicate contested maritime boundary claims, discussed in further detail in the next section.

## NATURAL DISASTERS

Asia is the most disaster-affected region of the world, a challenge which climate change will continue to exacerbate. Long identified as the region with the greatest population at risk of natural disasters,[9] new modeling[10] based on UN data reveals economic losses from natural disasters about four times the level previously calculated, with most of the additional loss attributable to the damage that slow-onset drought is doing to rural agriculture.[11] While Southeast Asia is developing world-leading resilience expertise, its governments and societies are struggling to keep pace with projected increases in the frequency and severity of hydrometeorological disasters on critical areas like agriculture and coastal infrastructure. HA/DR capacity-building has been a tool for strengthening regional cooperation, but the severity of disaster risks that climate change is projected to bring will require far more. Shortfalls in adaptive measures, disaster response and resilience could have broader ramifications for the economy, the social compact between citizens and their governments, human and national security, and the broader regional political and security environment.

## EXTREME HEAT

Extreme heat waves can cause death in at-risk populations (such as the elderly), weaken individual metabolism and reduce one's ability to work, both in the fields for agricultural production and in cities. The wet-bulb globe temperature (WBGT) index helps determine the negative impact magnitude of warm, humid weather on human productivity. Studies indicate that occupational heat strain during work in heat stress conditions could decrease productivity by 2%-6% on a country level, for each additional degree the temperature rises above 24°C, depending on the humidity rate.[12] With 500 million people in Southeast Asia already exposed to severe heat levels today,[13] outdoor workers in labour-intensive industries will bear the brunt of future warming. McKinsey calculates a regional economic loss of 8%-13% of GDP per year by 2050 due to extreme heat.[14] Modeling by Verisk Maplecroft suggests that the region will suffer the greatest heat-related labour capacity loss globally: a 16% decrease by 2045, with Malaysia, Indonesia and the Philippines most impacted.[15] These heat-related losses in economic performance could affect growth trajectories in the region, in ways that might intersect with regional security issues, degrading some livelihoods and increasing grievances with governments.

## FOOD SECURITY

Climate change can render the already complex relationship between food insecurity and conflict even more fraught.[16] Agricultural productivity in Southeast Asia is projected to decline due to climate variability,

including more variable monsoons. Fisheries are also at risk, as ocean acidification and rising temperatures are altering migratory routes of economically vital fish, which are already under stress from overfishing.[17] This will be particularly impactful for the region's population, for whom fish is a key source of protein and income.[18] As Southeast Asia is home to about 9% of the global population, but 18% of the global fish market,[19] the decline will have ramifications outside the region. According to a 2017 analysis from Australian climate security researcher Dr. Michael Thomas, increasing competition for declining stocks "could further strain the international rules-based approach to fishing governance and could well increase tensions, violent confrontations and military brinkmanship over the multiple overlapping and competing territorial claims in the South China Sea."[20]

## WATER SECURITY

The predictability and reliability of seasonal weather patterns will decrease in a changing climate, including the monsoon and seasonal variations in river flows, with consequences for both water and food security in Southeast Asia. Given the dependence of mainland Southeast Asian countries on rivers for agricultural productivity and other economic activities, these changes are likely to increase tensions around transboundary water management. Indeed, the previously cited UN Economic and Social Committee analysis identified transboundary river basins in both South and Southeast Asia as one of four "hotspots" for converging risks in the region, with underlying persistent poverty, under-nourishment and hunger compounding the threats caused by natural disasters.[21] A case in point – and frequently in the news – is the Mekong River, whose source is in China but whose 60 million beneficiaries include populations in Cambodia, Laos, Thailand, Myanmar and Vietnam. Reduced flow in the Mekong prompted the Thai Prime Minister to order military aid to affected areas in January 2020,[22] while Vietnam declared a state of emergency in early March.[23] Some reports attribute the droughts to upstream Chinese dams while others attribute the reduction to natural occurrences.[24] [25] [26] With Southeast Asian nations walking a political tightrope between two sparring superpowers, and both the US and China initiating new data platforms on Mekong river flow at the end of 2020,[27] it's clear that both "data diplomacy" and hydroelectric dam operational decisions should be sensitive to potential unintended negative social and political impacts.

## URBAN ISSUES

Climate change will make Southeast Asian cities' challenges more difficult to manage, in ways that could affect the overall security environment. Many of these cities currently experience rapid and unplanned urbanization, urban poverty, inequality and exclusion, rural to urban migration and the growth of marginal or informal settlements, and limited capacities to provide basic services. Additional disasters, population displacements, food and water insecurity, health impacts and other climate-related stressors and shocks will further challenge urban governance. Risk reduction and resilience will be increasingly important to maintain the social compact and provide stable governance.

# CLIMATE CHANGE-RELATED SECURITY THREATS

While Southeast Asia is relatively stable, the region faces a number of underlying security challenges, including growing violent extremist organization activity, and is a focal point for geopolitical tensions between the United States and China. Climate change will likely exacerbate these challenges and make them more difficult to manage.

## DISPUTES IN THE SOUTH CHINA SEA

There is significant tension around territorial claims, fishing, sub-sea minerals and security[28] in the South China Sea, particularly between China and Southeast Asian countries. China is solidifying its claims, contrary to international law, for control of the sea lines of communication by building up military assets (airstrips, port facilities and long-range sensor arrays) on contested features that could be submerged as sea levels rise. There are significant resources at stake, including oil and gas, fish, and sub-sea minerals that are relevant for the renewable energy transition.

ASEAN sea lanes may also become a stage for larger geopolitical disputes. The Strait of Malacca alone witnesses the passage of 15 million barrels of oil per day,[29] part of the estimated $5.3 trillion of goods sailing ASEAN waters each year. Trade flow interruptions could disrupt industries and economies worldwide. Increasing international tensions, competing territorial claims, rising seas and concomitant construction of island-based military outposts,[30] are making such interruptions more likely.

These tensions have induced both Chinese and regional militaries to project their naval presence, to protect fishing fleets and trading vessels. Additionally, US military "freedom of navigation" operations intended to promote customary international law have spiked, doubling from 3 to 6 from 2016-2017, rising to 9 in 2019.[31]

## COMPETITION OVER OIL AND GAS

The US Energy Information Agency (EIA) estimates there are approximately 11 billion barrels of oil and 190 trillion cubic feet of natural gas in proven and probable reserves in the South China Sea.[32] To put these figures in context, they represent about 2 years of oil and 17.5 years of gas for China.[33] A Chinese National Offshore Oil Company survey in 2012, which included areas not covered in the EIA estimate, puts the figures much higher: 125 billion barrels of oil and 500 trillion cubic feet of natural gas.[34] The US government estimates that these reserves are worth $2.5 trillion.[35]

Control over access to these reserves is disputed. At issue is the Chinese "9-dashed line," which defines China's view of its marine territory in the South China Sea (Figure 1). *The 2002 Declaration on the Conduct of Parties in the South China Sea*[36] was established as a basis for collaboration between China and ASEAN on maritime territorial issues. However, Chinese moves to halt Malaysia,[37] the Philippines,[38] and Vietnam[39] from exploring in disputed waters, while preparing for its own offshore exploration in waters off Vietnam,[40] have rankled regional neighbors and provoked strong condemnation from the United States.[41] As China, Vietnam and the Philippines consider their energy development options going forward, this issue will remain a potential catalyst for conflict.


Figure 1: A representation of the Chinese nine-dash line (in red), which delineates Chinese marine territory claims in the South China Sea.

Source: Wikimedia Commons.

Southeast Asia is also experiencing a decline in fish stocks, as described in earlier sections of this report. As fishing vessels sail further from shore, there is evidence of escalating shows of force[42] [43] from China claiming the entire area as its own. Small local vessels are confronted with armed Chinese vessels, and Chinese fishing boats are accompanied by coast guard or military-style guard ships. The confluence of dwindling stocks and being treated like pawns in a geostrategic game puts undue pressure on Southeast Asian fishermen, who already

have to navigate disputes amongst ASEAN members.[44] In September, the Chinese Coast Guard reported it had driven over 1100 fishing boats from the northern half of the South China Sea in the preceding four months, as well as detained 11 vessels and over 60 foreign crew members. An effort to craft a code of conduct for the area has been ongoing since 2002, but the escalating tensions make it unlikely to reach fruition soon.

As climate change will only amplify the challenges in the disputed waters, containing and addressing the underlying tensions will become even more critical. A prime example is Vietnam, which is geographically well-suited for fishing and where fishing plays an important role in the economy.[45] The sector's exponential growth can be attributed to the increasing role of aquaculture.[46] Unfortunately, both aquaculture and marine capture are at risk from climate change: the former from flooding and sea water intrusion and the latter from migration of fish stocks out of Vietnam's EEZ, due to ocean warming and acidification.[47] An incident in April 2020 wherein a Chinese vessel rammed and sank a Vietnamese fishing boat off the Paracel Islands elicited protests from both Vietnam and the Philippines, suggesting that Southeast Asian states may find courage in cooperation in face of Chinese actions in the South China Sea.

## VIOLENT EXTREMIST ORGANIZATIONS

Climate change implications for the economy and natural disasters can also affect security issues like violent extremism that are rooted in sociopolitical and governance challenges. Sub-national insurgent groups in Southeast Asia, often based in minority religious communities, have been seeking power and independence through sporadic acts of violence for decades. Examples include the Barisan Revolusi Nasional-Koordinasi and affiliated groups in Southern Thailand, and the ISIL-linked Abu Sayyaf and Maute groups and communist New People's Army in the Philippines. These groups offer alternative employment in impoverished areas, where low levels of education and menial employment render entire villages vulnerable to the broader impacts of climate change shocks and stressors. They are also adept at leveraging animosities that have endured from colonial-era inequalities in many countries. There has been evidence that militant groups are particularly interested in recruiting fishermen experienced in making and using explosives for "blast fishing," which has been banned in Southeast Asia but is still frequently practiced.[48] Declining fisheries, including due to climate change-driven phenomena such as saltwater intrusion into freshwater and brackish fish hatcheries, and a warming and acidifying ocean, means susceptibility to such practices may rise.

While this dynamic around livelihoods and VEO recruitment remains to be studied in depth in Southeast Asia, the broader disruptions of climate change to state capacities can increase ungoverned spaces and VEOs' room for maneuver.

Another factor which may prove relevant in the region's future security picture is the large youth cohorts in the Philippines and Laos. While many countries across Southeast Asia have harnessed their youth bulges to deliver a demographic dividend, some countries are still undergoing a demographic transition. As climate change reshapes livelihoods and economic performance, special attention should be paid to maintaining a strong social compact and meeting the economic needs of youth. When young people's expectations are not met, particularly economic expectations, this can fuel frustrations with government that can contribute to violence under some circumstances.[49]

## TRANS-BOUNDARY WATER TENSIONS

Regional resource governance – especially transboundary water sharing – is another source of inter-state tension. The Mekong is a case in point.

The Mekong River, which flows 4,000 km from the Tibetan Plateau in China through Myanmar, Laos, Thailand, Cambodia and Vietnam, is a vital source of both food and commerce for the 60 million people living in its basin. Water dropped to its lowest level in 100 years during the summer of 2019, devastating fish catches,[50] upsetting crop cycles and impacting the riverine environment. A U.S. Government-funded study[51] which modeled the recorded flow versus a natural (unimpeded) flow between 1992-2019 found over 126 meters of river water "missing:" the result of water extracted or stored in upstream dams and reservoirs. The drop-off corresponded to the addition of eleven major dams built since 2012 by Huaneng Hydro Lancang, a Chinese state-owned enterprise cited[52] for poor overseas environmental and social governance performance. The inter-governmental Mekong River Commission vacillated, calling for more information and collaboration – and the authors agreed that better collaboration could even the flow. Yet consternation continues, as more dams are planned and the Chinese government and majority state-owned China Communications Construction Company have announced intentions to dredge the river to enable passage of massive cargo ships, and potentially military vessels.[53]

## MILITARY READINESS

Climate change also presents challenges for military readiness and operations. More frequent and intense storms will increase the demand for HA/DR operations. As the number and intensity of storms increase, so does the number of emergency deployments. At the same time, climate change can threaten the hard and soft infrastructure on which militaries rely. For example, coastal and riverine military installations and critical civilian infrastructure, such as power plants and transportation, are at risk from extreme weather, flooding and sea level rise. Training may be curtailed or cancelled by high temperatures and high winds. As well, vital assets such as planes or ships may need to be altered to operate safely in hazardous weather conditions.

Equally critical, but less widely recognized, is the *threat multiplier* effect that climate impacts can have on sensitive security situations. As illustrated above, extremist groups can turn climate-induced resource scarcity into a recruiting tool for separatist or violent activities. Military personnel may be directed to accompany civilian fishing boats in disputed waters, or sandbag beaches at risk of erosion near important populated areas. Perceptions that military assets are being deployed to help one ethnic or socio-economic group at the expense of another, can cause undue tension in developing states.

# THE ENERGY-CLIMATE SECURITY NEXUS

How Southeast Asia manages growing energy demands will shape regional climate security risks in the near, medium and long term. Growing economies and a burgeoning middle class are spurring demand for energy. Southeast Asia's energy consumption has grown 80% since 2000 and is set to expand another 60% by 2040,[54] with electric power consumption increasing at 6% a year – amongst the fastest in the world.[55] Cooling is a key factor driving demand and is expected to grow significantly. Fewer than 20% of households across the region have air conditioning; in Indonesia, the most populous country, the figure is less than 10%.[56] As climate change pushes temperatures to ever-higher and less-tolerable levels, effective provision of space conditioning will be key to maintaining public health.

How this power is generated will have long-term consequences for both human health and climate security risks. Currently, coal is the fastest-growing contributor to the regional fuel mix. Coal-fired power plants pose serious health threats: the World Health Organization estimates that air pollution in Southeast Asia caused 2.4 million premature deaths in 2016, a figure set to rise as more coal plants come online. Moreover, the carbon dioxide coal emits – twice that of natural gas plants[57] – contributes significantly to greenhouse gas accumulation in the atmosphere, hastening climate change.

## COAL

As other regions of the world eschew new coal, attention is turning toward its remaining proponents – nearly all in the Indo-Pacific region. Of the approximately 500 gigawatts of coal plants under construction or planned, more than 80% are in Asia, according to the NGO Global Energy Monitor. But there are signs the tide of coal financing is turning. Analysts note that many planned plants are not economically viable and low emissions standards in developing countries increases costly health and environment outcomes.[58] Between 2015-2019, coal capacity under construction or in pre-construction development in Southeast Asia dropped by half, from 153.2 GW to 78 GW.[59] With private investors[60] shying away from potential stranded assets, financing comes predominantly from the governments of Japan, South Korea and China. Yet in late 2020, all three countries pledged to become carbon neutral by mid-century[61] – a commitment likely to highlight any discrepancy between their domestic and foreign assistance policies and offer fodder to those pursuing a post-COVID "green growth" recovery plan.


Figure 2: The robust pipeline of planned coal plants in Southeast Asia. Figures in each circle represent the number of generating units at each location.

Source: Global Coal Plant Tracker as of Oct 2020.

Similarly, countries in Southeast Asia have been examining other energy alternatives, in light of changing international norms regarding fossil fuels and global treaties such as the Paris Agreement. The climate-energy security nexus is highly complicated in this region, as nations balance their particular geographic and historical circumstances and their populations' rising energy demands with increasing international pressure to curb emissions and slow global warming. Energy solutions in this region cannot be addressed with a one size fits all approach – there are unique climate, economic, and security factors that must be taken into consideration for both mainland and maritime zones.

Singapore, for example, has limited energy options in large part due to its small geographic size. However, the government is aiming for renewables to make up around 8% of the country's peak electricity demand by 2030 – using rooftops and other aspects of the urban environment to support solar development.[62] Indonesia and the Philippines, both island nations, must navigate geographical nuances as well. Utilizing renewable energy resources would require a complete restructuring of electric transmission due to the nature of their grids.[63] Currently, hydropower and biofuels comprise the majority of renewables in the region while wind and solar power are projected to grow exponentially in the coming years.[64]

## NUCLEAR, GEOSTRATEGIC TENSIONS AND CLIMATE RISK

Several states in the region are exploring the role of civilian nuclear power programs. The Philippines, Thailand, Malaysia, Vietnam, and Indonesia have all signaled interest to varying degrees, although Malaysia[65] and Vietnam[66] halted plants in recent years while officials in Philippines,[67] Thailand,[68] and Indonesia[69] remain hopeful that civilian nuclear energy programs will one day become a reality.

Underscoring the complexity of the climate-energy security nexus, nuclear energy development in Southeast Asia could add to the great power tensions currently unfolding in the area. For example, Rosatom, Russia's state-owned nuclear energy corporation, and the Philippines have signed agreements signaling long term cooperation while China and Thailand have a similar arrangement.[70] [71] Any partnership surrounding resource-intensive energy projects are sure to plant a permanent flag of influence in Southeast Asia. This is particularly the case with nuclear technologies because the agreements would require long-term presence and oversight from the external supplier, which in the aforementioned cases would be Russia and China.

As states prepare to meet growing energy demand, they must also take into account the negative impacts climate change can have on energy development, from infrastructure to electricity transmission. For those nations that are exploring nuclear reactors, and even other energy alternatives, forecasting how sea level rise and higher temperatures can affect sites is critical. For example, about 25% of the world's 460 civilian nuclear reactors are located at the coast,[72] to take advantage of proximity to water for cooling. But flooding linked to sea level rise amplified by storm surge can disable electrical systems, halting cooling and potentially leading to overheating and nuclear meltdown. Flooding devastated the Fukushima Daiichi plant in Japan as part of the 2011 Triple Disaster, showing that extreme weather events are outpacing what experts once viewed as adequate planning.[73] Increases in changing climate impacts, and other dynamics, will increase this catastrophic risk even further unless addressed.

Innovation and adequate funding are essential for Southeast Asia to pivot away from fossil fuels. Comprehensive energy trade investments that seek to address existing and mitigate future climate-related threats such as flooding, heatwaves, and natural disasters while accommodating local security conditions will be necessary to ensure stability throughout Southeast Asia.

# RECOMMENDATIONS

The cacophony of converging risks outlined above should be addressed systematically and continuously. It is critical that responsible authorities holistically incorporate climate security into their portfolios; and that there be cross-disciplinary feedback loops to identify and address unintended consequences. The recommendations that follow are communicated to government policy-makers in the domains of military and security, national-level governments in Southeast Asia, and energy policy makers. They should be directed broadly, to the constituent stakeholders of each of these groups as well.

*Military and security actors* should incorporate climate change projections and predictable cascading effects into security planning, training and operations in a holistic and systematic manner. A first step is to assess military assets and capabilities against the latest climate science, and stress-test assets and operational doctrine when past planning assumptions become outdated. Climate's threat multiplier effect should be considered in threat assessments, planning, training and joint military exercises. At the regional (or ASEAN) level, Southeast Asian states should establish "Climate Security Watch Centers"[74] to collect information and intelligence, perform analyses and make recommendations to policy-makers. Regular joint exercises could improve readiness for not only disaster response, but also promote other common objectives such as enforcing the Law of the Sea. Experience-sharing from expert groups such as the International Military Council on Climate and Security[75] could accelerate practical application of such goals. Routinely measuring, managing and accounting for the time, money and manpower spent on climate-related security situations can smooth the path toward continuous improvement. Finally, military organizations cognizant of their increasing role working alongside civilian humanitarian, fishing, or other organizations should develop and practice protocols to build trust and efficiency, and decrease the likelihood of unintended outcomes.

*Regional governments* should assess and manage climate security risks and the climate-energy-security nexus at national and regional levels. ASEAN platforms could coordinate data-sharing, planning, funding and emergency response. Policymakers might proceed along three key steps. The first is to assess climate change impacts on existing security stress points. This would include populations already vulnerable to climate security risks, areas of extant ethnic or other tensions, and competition in the global commons, particularly in the South China Sea. The second step is to improve conflict management capabilities, particularly for sub-national conflicts where interests may be partially met by social and economic development. The third step is to focus on prevention. Targeted domestic economic assistance and regional diplomatic overtures and development aid could prevent tensions from escalating into conflict. Proactively bringing stubborn disputes to bilateral or regional platforms such as the ASEAN Enhanced Dispute Settlement Mechanism could serve the same goal. In a similar vein, ASEAN states could develop a joint management strategy for regional territorial disputes, covering both land-based and sea-based resources, including fishing and oil and gas. The strategy should incorporate fact-based threat assessments, including climate security threats, and be shared with all parties. Applying this new strategy to resolve the ongoing Philippines-Malaysia spat over Sabah[76] would demonstrate the alliance's resolve and capability, sending a signal to China on respect for the rule of law, particularly around United Nations Convention for the Law of the Sea rules.

*National energy officials* should take similar steps to incorporate climate security threats into energy policy development, and ensure energy policy is not working at cross-purposes with national and regional security interests. Key to this is for each individual ASEAN Member State to institute a carbon emissions drawdown strategy for its national energy economy. Several steps that ASEAN has taken collectively should facilitate this measure, including a Lao PDR - Thailand - Malaysia Power Integration Project; action to harmonize interconnection codes, charging and data sharing; and other investments to facilitate the growth of renewables in the region.[77] Continuing to prioritise renewables would help temper demand for Japanese, Chinese and Korean aid to build coal-fired power plants, while shifting focus to clean energy, energy storage and related assistance. It would also help mitigate investment in stranded assets and prevent the carbon emissions that drive climate security threats. In line with recent research showing that coal must be phased out globally by 2040 to meet the 1.5°C goal,[78] Southeast Asian states might embrace a recent World Economic Forum proposal for a systemic coal draw-down via a "coal retirement mechanism" and a "sustainable energy transition mechanism," engaging multilateral development banks and institutional investors.[79] Implementing such mechanisms at scale could meaningfully contribute to not only curbing carbon emissions but also promoting human and environmental health and prosperity. At the same time, regional and local leaders must incorporate technologies and strategies that take planning and modeling around energy sites into consideration to ensure long-term energy security. For example, utilizing climate mapping tools to layer forecasted impacts such as sea level rise overcurrent and planned energy sites would help ensure that these risks are adequately addressed.

## CONCLUSION

Climate change threatens not only social and economic well-being in Southeast Asia, but security as well. Addressing climate security requires systematic assessments of climate-vulnerable stress points, ranging from contested resources to domestic insurgent groups to broad geopolitical disputes over land and the global commons. Following such assessments, military, security and foreign policy professionals have a responsibility to proactively protect populations at risk and prevent existing tensions from escalating, ever mindful of the dynamic nature of both security threats generally and climate security threats in particular. Energy policy makers have a critical role to play in garnering the political will to decarbonize, prioritizing the positive medium and long-term net effects of lower-carbon power. Only by raising the visibility and priority of such actions can policy makers safeguard the climate security of Southeast Asia.

# NOTES

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