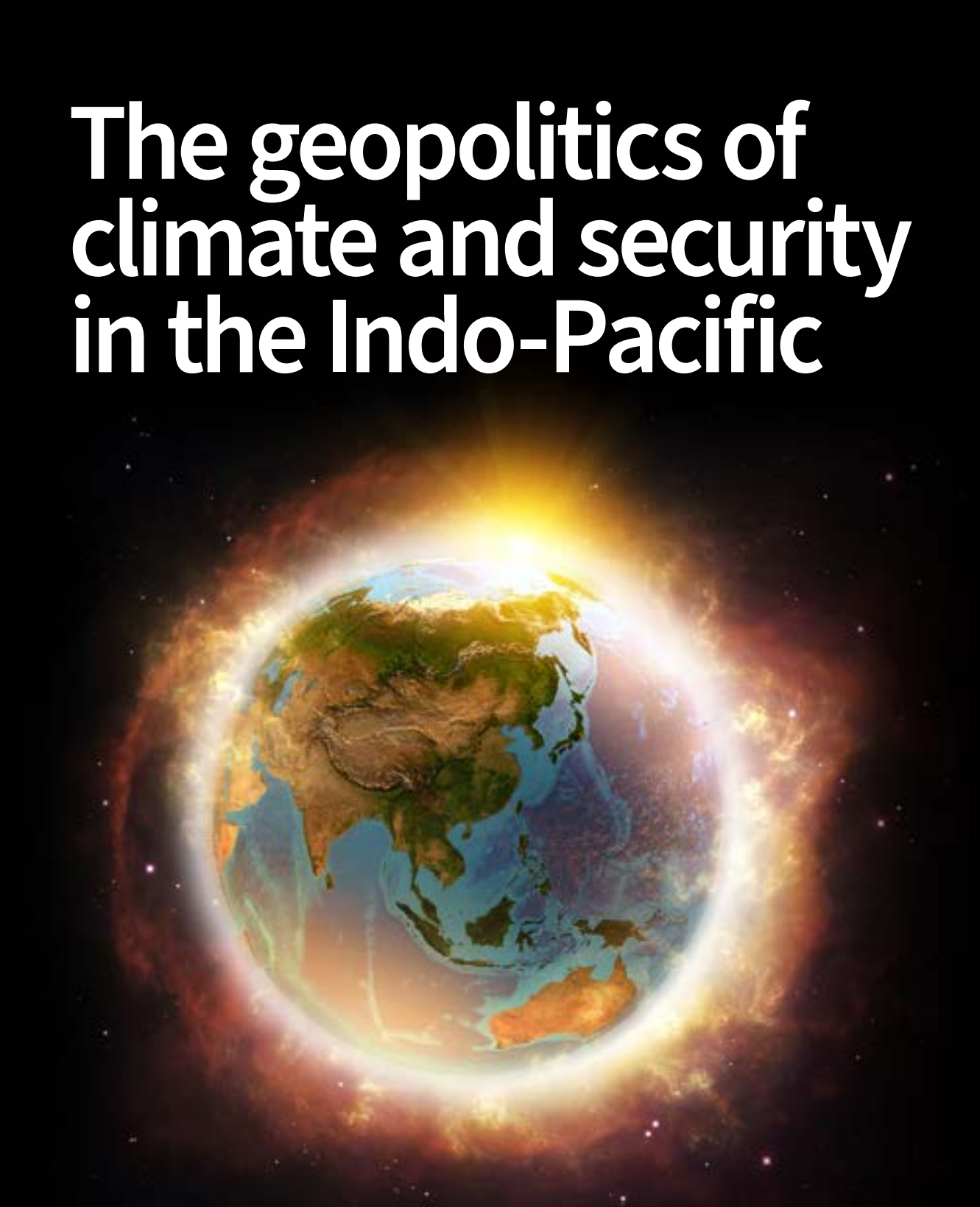
The geopolitics of climate and security in the Indo-Pacific



ASPI
AUSTRALIAN STRATEGIC POLICY INSTITUTE

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KONRAD ADENAUER STIFTUNG

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First published February 2022

Published in Australia by the Australian Strategic Policy Institute

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ISBN 978-1-925229-73-8 (print)
ISBN 978-1-925229-74-5 (online pdf)

Cover image: Depiction of global warming/climate change disaster on planet earth, iStockphoto/titoOnz.

Funding support for this publication was provided by Konrad-Adenauer-Stiftung

Contents

Foreword

Robert Glasser

One of the great challenges in assessing the international security implications of climate change, as this book attempts to do in the context of the Indo-Pacific region, is the enormity of the task. Climate change is much more than an environmental crisis (notwithstanding the fact that national climate change adaptation plans are still developed predominantly by environment ministries). It is, in fact, a global *systemic* crisis with disruptions that will transform the geopolitical landscape. The Indo-Pacific, already the most exposed region in the world to climate hazards, will be profoundly affected.

It's not surprising that the systemic nature of this problem is often underappreciated. Systemic changes are technically extremely difficult to model. The United Nations Intergovernmental Panel on Climate Change (IPCC), the authoritative source on these matters, acknowledges this difficulty.[1] Much of the work reviewed by the IPCC treats climate hazards as independent variables rather than looking at the wider context in which they interact with other hazards and with human systems. For example, studies may focus on the impact that rising temperatures will have on agricultural productivity, but not on the compounding impacts of other hazards, such as flooding, drought, fires, increases of pests, saltwater inundation, cyclones, migrations of people and so on, all of which may be occurring simultaneously. It's analytically difficult to do this and to take account of how hazards can trigger other disruptions and cause cascading impacts—and responses—in human systems.

It's not just the systemic impacts of climate change that are undervalued, but also how rapidly those impacts will begin appearing. The climate science suggests the pace at which they emerge is now accelerating nonlinearly. Climate change 'tipping points'[2] can result in rapid, nonlinear changes, but the non-linear pace of change is already apparent, even without the emergence of tipping points. Extreme heat events, for example, have already increased 20-fold over the past 10 years, relative to the previous 30 years.[3] Research suggests that in a matter of decades severe floods that are currently termed as one-in-100-year events will become annual events in many parts of the world.[4]

Any examination of the regional security implications of climate change that doesn't take into account these systemic impacts and the rapid pace at which they'll begin appearing is likely to paint a misleadingly positive picture. With that in mind, we've developed a climate change scenario set in the year 2035 as the reference point for each of the chapters in this volume. The scenario draws on climate science and extrapolates from recent history to illustrate both the systemic impacts and the scale of the hazards that have emerged by 2035.

One obvious implication of the systemic nature of the changes is that narrow definitions of 'security', focused on issues such as great-power competition, terrorism and military forces, are insufficient to capture the nature and scale of the security challenges and their interactions. With this in mind, the volume also focuses on human security (such as poverty

and inequality and food insecurity) and economic security (the energy transition, regional trade, sovereign risk and so on). We've additionally included a section on climate stress and regional institutions, which explores how systemic climate impacts in 2035 are likely to affect the capacity of organisations such as the Association of Southeast Asian Nations, the Asia Development Bank and the Pacific Island Forum to address broad security challenges.

Part 1 of this volume presents the 2035 scenario, including the evidence base underpinning it. Part 2 focuses on human security and climate change, Part 3 on regional conflict and climate change, Part 4 on economic disruption and climate change and Part 5 on climate stress and regional institutions. Part 6 summarises the conclusions and provides some initial policy recommendations gleaned from the authors' contributions.

Not every policy expert is comfortable extrapolating from the present to address a future scenario. Fortunately, the stellar group of experts who have gathered together for this volume are. They have written their chapters in a variety of different ways. Some authors have looked to 2035 from the present, others have placed themselves in 2035 and looked back. Some have concentrated on the Indo-Pacific region as a whole; others have focused on particular countries in the region or specific issues to illustrate the regional implications. We're grateful not only for the considerable expertise they have shared, but also for the flexibility and creativity with which they've approached this somewhat unconventional project.

I particularly want to thank my ASPI colleagues for their guidance and support. Will Leben has been instrumental and fundamentally important to the success of this project. Anastasia Kapetas played a major role in the intellectual foundations and design of much of the work. Michael Shoebridge, the director of ASPI's Defence, Strategy and National Security Program, improved the quality of the outcome by providing very useful comments on the draft chapters. I also want to thank Cathy Johnstone, our content editor, for her crucial assistance over the past months.

Most importantly, I want to acknowledge and thank sincerely the Konrad-Adenauer-Stiftung (KAS) for making this project possible. Our KAS colleagues have been enormously supportive, flexible and highly professional. They do remarkable work in Australia, regionally and across the globe, contributing to improving public policy and the state of the world in areas such as security, innovation and democracy. We're extremely grateful for their confidence and support.

Notes

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Part 1
A climate scenario: the Indo-Pacific in 2035

1. The climate scenario for 2035

Matthew Page and Robert Glasser

The 2035 scenario is an extrapolation from current climate science and observations of recent extreme climate-related hazards and their societal impacts.[1] It isn't a prediction of the future, but rather a description of a plausible future for the Indo-Pacific region designed to stimulate the thinking and creativity of the policy experts who have contributed to this volume. The 2035 scenario is presented below, followed by supporting documentation for its assumptions.

The 2035 climate scenario

It's the year 2035. The climate has warmed by over 1.5°C—the lower target set by countries in the 2015 Paris Agreement. Climate hazards are significantly undermining human security in multiple dimensions: economic, political, social and environmental.

The range of hazards that are now ever-present isn't surprising. Scientists had for decades warned of more frequent, longer and hotter heatwaves; accelerating sea-level rise; increased torrential downpours; intensifying storms; altered distribution of pests and pathogens; ocean heating and acidification; hotter, longer bushfires; and longer and drier droughts. But policymakers greatly underestimated the scale of those hazards, how rapidly they would begin emerging (in effect, simultaneously), and the compounding and cascading societal disruptions they would cause. That became abundantly clear during the 2032 global food security crisis, triggered by the record-setting El Niño event that affected the rice bowls of Vietnam and China, among others.

Global energy transformation

The crisis accelerated political action to reduce greenhouse gases, although the global energy transformation from fossil fuels to renewables had already been proceeding rapidly, driven by the steadily decreasing costs of renewables and improvements in energy-storage technologies. Not surprisingly, venture capitalists, asset managers and financial regulators were among the first to detect the climate change 'signal' in the market. By the mid-2020s, they had begun redirecting billions of dollars of investments away from fossil fuels and infrastructure threatened by climate change impacts and into renewable energy and more resilient assets. Today, numerous countries reap the benefits of the energy transformation, but others have been unable to adjust rapidly enough. They have not only lost geopolitical influence, but declining revenues have also led to reductions in domestic investments, weaker social safety nets and growing public discontent.

Trade

Climate change has disrupted global trade significantly over the past decade. The energy transition has reduced trade linked to fossil fuels while increasing trade linked to new energy products such as hydrogen, high-capacitance batteries and green steel. Climate impacts have disrupted supply chains, markets, customers and facilities. Most global trade is still carried by sea and handled in ports, but the combination of sea-level rise and increasingly intensive storms have closed them, often for months.

Less developed countries

Less developed countries have been hit the hardest by climate hazards. Lack of capacity and ineffective government responses to disasters have amplified public discontent over growing inequality, entrenched corruption, lack of government services, and weak institutions of governance. Both governments and their detractors are using digital disinformation to pursue their agendas, with further polarisation often the result.

Non-state actors

It isn't surprising that civil society, separatist movements, terrorism and organised crime have increased in less developed nations, as non-state actors move into the spaces abandoned by government. It was surprising, however, how rapidly those non-state actors developed a regional and global presence. The audacity and effectiveness of the 2033 Summer of Terror attacks across Southeast Asia and elsewhere revealed that those groups are now integrated, operating transnationally and benefiting financially and organisationally from the political, economic and psychological impacts of their actions.

Great-power competition

It's encouraging that outside powers, when they aren't internally preoccupied with domestic climate-driven disasters, have continued to provide disaster relief and other humanitarian assistance to countries struggling with climate change. Less encouraging is that the instability in those places has also created opportunities for great-power competition and intervention. The incident earlier this year in the South China Sea, the fourth in less than a decade, demonstrated how strategic competition, opportunism, alliance commitments, digital disinformation and miscalculation can contribute to the outbreak of conflict and undermine efforts to de-escalate tensions. This doesn't bode well for the decade ahead.

Population displacement

The past few years have again confirmed that the Indo-Pacific region, where over half of the Earth's population resides, often in dense concentrations, is highly exposed

to climate and other hazards. In Indonesia, for example, the sea level has now been rising at the fastest rate globally for decades. As a consequence, what was in 2020 a 1-in-100-year extreme flood is now an annual event in many parts of the country, regularly displacing large proportions of Indonesia's 310 million people. Most are internally displaced, but some join the tens of millions of similarly displaced people across the region seeking refuge in other countries. Last year, one Pacific island country relocated its entire population to Australia.

High regional exposure to climate hazards

Much of South Asia and Southeast Asia is highly exposed to El Niño and La Niña events. Both phenomena have become more severe (wet years have become wetter, with greater cyclone risk, and dry years have become dryer). The region is today in a precarious position. The current La Niña is intensifying, causing record flooding in places that are still recovering from the extreme heat, drought and food security shocks from last year's El Niño and the devastating 2032 crisis. Humanitarian assistance from outside the region is unlikely, given that another atmospheric blocking event linked to the disrupted jet stream has emerged. It's causing record-setting extreme heat and fires across the western US, southern Canada, much of Europe and Siberia. The same blocking event, the kind that climate scientists long ago confirmed is linked to climate change, is simultaneously affecting the South Asian subtropical monsoon, triggering extreme flooding in parts of the subregion that might otherwise have escaped La Niña-driven inundation.

Regional institutions and organisations

Regional institutions and organisations, such as ASEAN, the Pacific Islands Forum and the multilateral development banks, have scaled up their efforts over the past two decades to meet the various economic, political, social, security and humanitarian challenges arising from the warming climate. In the Pacific, for example, they've been instrumental in building climate resilience and relocating island communities displaced by the rising sea and stronger cyclones. But their efforts are now more typically overwhelmed by the scale of the climate hazards and their cascading impacts. They're struggling to promote regional approaches to the crises, with some states instead choosing to erect barriers and turn inwards.

It's encouraging that most countries, together with regional and multilateral institutions and the private sector, last month agreed to convene a process in 2036 to re-energise multilateral efforts to address these multifaceted challenges. The latest IPCC scientific assessment suggests that the rapid transition to renewables and recent more ambitious political action are likely to keep warming below 2.5°C, thereby diminishing the risk of crossing additional dangerous climate thresholds.

The factual basis for the 2035 scenario

The authoritative global source of information on the pace of climate change and climate impacts (and the scientific basis underpinning other aspects of climate change) is the UN Intergovernmental Panel on Climate Change (IPCC).[2] Its most recent scientific assessment report (AR6) found that each of the past four decades has been successively warmer than any decade that preceded it since 1850. It also found unequivocally that global mean surface temperatures had increased by 1°C (relative to the 1850–1900 period) as a consequence of human activity.[3]

The report also concluded—based on consideration of a range of future emissions scenarios, from large net increases to steep reductions and net zero greenhouse gas emissions totals—that global surface temperatures were likely to increase throughout the 21st century and were very likely to reach 1.5°C higher within decades.[4] In the scenarios studied by the IPCC, there's a more than 50% chance that the 1.5°C target is reached or crossed between 2021 and 2040 (a central estimate is in the early 2030s).[5]

The references in the 2035 scenario to the direct consequences of this warming have been well documented, including more frequent, longer and hotter heatwaves;[6] coastal flood risks from accelerating sea-level rise[7] as well as torrential downpours and intensifying storms causing flooding;[8] altered distribution of pests and pathogens;[9] ocean heating and acidification; hotter and longer bushfire seasons;[10] and longer and drier droughts.[11]

Compound climate hazards and cascading impacts

The IPCC acknowledges the difficulty of incorporating compound and cascading impacts in its analyses. In its special report on 1.5°C of warming, it observed that '[t]he literature on compound as well as interacting risk at warming of 1.5°C and 2.0°C is limited[12] and that 'multi-sector risks are projected to overlap spatially and temporally, creating new (and exacerbating current) hazards, exposures, and vulnerabilities that will affect increasing numbers of people and regions.'[13] The AR6 report noted with high confidence that the land area affected by 'concurrent extremes' has increased.

A number of recent studies highlight the role compound hazards play in magnifying societal impacts,[14] as do numerous historical events. In Australia, a record-setting drought combined with record-setting extreme heat contributed significantly to the outbreak and unprecedented intensity of the 2019–20 'Black Summer' bushfires that burned over 20 million hectares of land. The heat of the fires was so intense that it caused a 'super outbreak' of fire-induced pyro-cumulonimbus (PyroCb) thunderstorms, injecting smoke plumes directly into the stratosphere at a scale comparable only to a major volcanic eruption.[15] The PyroCb storms also generated hundreds of lightning strikes, which ignited further fires, exacerbating the already horrific situation on the ground.[16] This 2019–20 PyroCb event was the largest ever recorded since the phenomena was first recognised in 2000.[17] The Black Summer bushfires also exposed millions to smoke-related air pollution and caused hundreds of smoke-related deaths.[18]

The Syrian civil war is a global-scale illustration of cascading impacts from climate hazards. Between 1998 and 2011 the country experienced its worst drought in at least 900 years.[19] From 2006 to 2011, the country suffered massive crop failures, which undermined livelihoods and forced millions of people to move from rural areas into cities. This mass migration significantly exacerbated social stresses in Syrian cities. Clearly this wasn't the cause of the Syrian civil war, but it was a contributing factor, and the cascading impacts were profound: a refugee crisis in the region became a refugee crisis in Europe, which in turn contributed to Brexit and the rise of populist governments. Scientists estimated that climate change made the Syrian drought two to three times more likely.[20]

The 2032 global food security crisis

The 2035 scenario refers to a global food security crisis, triggered by a record-setting El Niño event. There are many historical examples of El Niños contributing to food insecurity, such as the 1998 food security crisis in Indonesia.[21] Similarly, the 2015–16 El Niño, one of the three strongest in 50 years, also affected Indonesia's[22] food security and contributed to widespread drought across Southern Africa.[23] Food prices doubled in some areas, creating a humanitarian crisis that affected 40 million people.[24]

Scientists expect 1.5°C of warming to double the frequency of extreme El Niño events.[25] The AR6 report also noted that 'concurrent extreme events at different locations but possibly affecting similar sectors (e.g. breadbaskets) in different regions, will become more frequent with increasing global warming.'

The 2035 scenario also draws upon the example of the global food security crisis of 2010–11. In the first seven months of 2010, the Russian Federation experienced an unprecedented heatwave, which attribution analysis suggests was made five times more likely as a result of climatic warming.[26] The heatwave was associated with an intense and prolonged atmospheric blocking phenomenon over western Russia[27] that simultaneously affected the South Asian subtropical monsoon, resulting in record flooding and a humanitarian disaster that affected 20 million Pakistanis.[28] In Russia, the extremely hot and dry weather helped trigger widespread wildfires, which destroyed 20% of the Russian wheat crop.[29] Fifty thousand people died from respiratory illness and heat stress.

The drought struck not only Russia, but eastern China and Ukraine as well, causing major reductions in those regions' wheat harvests. During that period, very heavy rainfall in both Australia and Canada further diminished wheat harvests.[30] This combination of impacts[31] contributed over the course of 2010 to a 40% increase in world food prices,[32] which, in turn, led China to make a large-scale wheat purchase to secure its domestic supply and Russia to levy an export ban for the same reason. That subsequently caused a spike in food prices in Egypt[33] and elsewhere in North Africa, where it became a major factor in the Arab Spring.[34] Protesters in Tunisia brandished baguettes, while in Egypt they demanded 'bread, freedom and social justice'. By the end of 2011, governments in Tunisia, Egypt, Libya and Yemen had been swept away by popular revolts.

Global energy transformation

The assumption underpinning the 2035 scenario that the global energy system is rapidly transforming from fossil fuels to renewables is now widely accepted by energy experts. Already more renewable energy is being added to global power grids annually than fossil fuels and nuclear energy combined.[35] Public and private investment in renewable energy and energy-storage technologies is expanding rapidly, driving down costs of renewable energy relative to fossil fuels and accelerating the electrification of the industrial and transport sectors.[36]

The scenario notes that venture capitalists, asset managers and financial regulators are among the first to detect the climate change 'signal' in the market and accelerate the transition with massive investments. This is happening today. Influential institutions and actors across the global financial sector are increasingly moving from treating climate change as a public relations matter to seeing it as a core business risk (and opportunity).

Sophisticated analysis by the world's largest asset manager, BlackRock, is already detecting major climate-change impacts on the value of investments, including evidence that the most climate-resilient utilities trade at a premium.[37] The company is advising its investors that that premium will increase over time as climate-change risks and dangers compound. Similarly, credit-rating agencies, such as Moody's, are factoring climate shocks into their analysis of municipal bond issuers' economies, fiscal position and capital infrastructure, as well as managers' ability to marshal resources and implement strategies to drive recovery. They're also developing a carbon transition assessment,[38] which measures how well companies will be able to operate in a low-carbon economy. In the lead-up to the COP26 summit in Glasgow in 2021, 733 investors representing over US$52 trillion in managed assets issued a joint statement urging governments to strengthen their nationally determined contributions and to reduce emissions by 45% from 2010 levels by 2030, as well as commit to net zero by 2050.[39]

The 2035 scenario assumes that the global energy transformation will have both winners and losers. While states that are early movers in the transition, as well as those that have the resources to adapt quickly in the coming years, are likely to reap the benefits of their efforts, many developing countries will face a significant challenge. For example, Africa as a whole accounted for just 1% of added renewable energy capacity in 2020.[40]

The International Renewable Energy Agency has nicely summarised the high-level geopolitical consequences of the energy transformation (and the basis for the assumptions about winners and losers in the 2035 scenario):

> The accelerating deployment of renewables has set in motion a global energy transformation that will have profound geopolitical consequences. Just as fossil fuels have shaped the geopolitical map over the last two centuries, the energy transformation will alter the global distribution of power, relations between states, the risk of conflict, and the social, economic and environmental drivers of geopolitical instability …

> How different countries fare in the context of the energy transition depends in no small part on how exposed they are to changes in fossil fuel trade flows. Equally important is their position in the clean energy race, the commercial race to become a leader in renewable energy technology.[41]

Trade

The 2035 scenario's assumptions about regional trade are based in part on the implications of the global energy transformation, but also on the existing exposure and vulnerability of trade infrastructure to climate hazards. Eighty per cent of the world's trade by volume and 70% of global trade value is transported along maritime trade routes and through the world's 3,700 ports.[42] In 2017, 72% of all port authorities were affected by extreme weather events, disrupting operations and causing delays and damaging physical infrastructure, particularly in the Asia–Pacific region.[43] These ports are highly susceptible to sea-level rise, storm surges and flooding.[44] In 2005, for example, Hurricane Katrina caused US$1.7 billion in damage to ports and a US$882 million reduction in agricultural trade.[45]

Other transport infrastructure is also likely to be adversely affected by increased operating costs, delays and shutdowns and by physical damage due to extreme weather. Paved road networks have already experienced damage and degradation from the extreme heat caused by heatwaves and bushfires,[46] and increased precipitation and extreme flooding frequently destroy unpaved road systems and bridges over and near waterways.[47]

Less developed countries

The 2035 scenario's assumption that less developed countries have been the hardest hit by climate change is an extrapolation based on extensive and well-documented historical evidence.[48] As the UN has pointed out:

> While all countries are vulnerable (as demonstrated by the Great East Japan earthquake and tsunami) the impact disasters have on Least Developed Countries and Small Island Developing States is perhaps the most challenging. For these States, disaster events have a significant impact on, or in some cases completely destroy, development gains built up over decades. Hurricane Ivan (2004) cost Grenada over 200 per cent of GDP. The earthquake in Haiti (2010) is estimated to have exceeded 15 per cent of GDP or 120 per cent of GDP when total damages and losses are included. In larger LDC economies, such as Bangladesh or Mozambique, the loss of 3 to 5 per cent of GDP, due to disasters, every five to ten years has a cumulative impact on development.[49]

Fragile states, as defined by a combination of limited government capacity, social inequality, conflict, and low legitimacy of public institutions, are highly exposed to climate risks.[50] The risks originate not just from a single climate hazard but from multiple, overlapping climate hazards. Developing countries more generally have weaker institutions of governance, larger concentrations of marginalised populations, fewer resources to invest in reducing disaster risk and early warning and weaker social safety nets to support affected populations after hazards

strike. As a consequence, it's not surprising that the vast majority of deaths from climate-related disasters have been in low and lower-middle income countries.[51]

Non-state actors

The 2035 scenario assumes that non-state actors will exploit the disruptions caused by climate change to strengthen their national reach and networks. This has already been observed today, although on a smaller scale than implied in the scenario. The relationship between climate-change impacts and the activities of non-state actors, such as terrorist groups and organised crime syndicates, is well documented.[52] Generally, the analysis suggests that climate change can exacerbate existing security threats and create or worsen the conditions that enable non-state actors to operate.

The literature suggests that these conditions are more common in countries where climate vulnerability, state fragility and violent conflict overlap and act as 'mutually and negatively reinforcing dynamics'.[53] For example, the success of Boko Haram in the Lake Chad region in western Africa[54] has been at least partially enabled by regional drought and desertification following successive years of rising temperatures and lowered rainfall. These climate impacts have compounded the threat to the food and livelihood security of local populations already under pressure from rapid population growth and poor governance systems. Boko Haram was able to exploit those insecurities in two ways: by gaining funding from controlling access to land and resources and recruiting new members by targeting individuals and communities with few economic alternatives.[55]

Similarly, terrorist attacks increased significantly in Sri Lanka and Thailand following the 2004 Boxing Day earthquake and tsunamis that struck off the Indonesian coast (although, conversely, the subsequent international aid response in Indonesia contributed to the resolution[56] of a longstanding separatist movement in Aceh).[57] The disaster exacerbated existing political and societal vulnerabilities and disrupted government security and control.

In Guatemala, following Tropical Storm Agatha in 2010, narco-trafficking groups were found to expand their illicit activities by providing basic services in areas lacking government support and control.[58] Drug-trafficking groups also hold substantial territorial control over some of the country's river systems, offering the potential to control crucial water resources as water scarcity increases due to unreliable rainfall and poor water management.[59] Water scarcity and livelihood insecurity in Afghanistan have also helped the Taliban coerce farmers into engaging in illicit opium production and recruit new members.[60]

Great-power competition

The 2035 scenario describes the great powers as somewhat internally preoccupied with domestic climate disasters, but still able, at times, to provide humanitarian relief to disaster-affected countries in the region. That may be a somewhat optimistic assumption, as historical evidence suggests that economic crises in wealthy countries are associated with significant reductions in international aid.[61] Nevertheless, the scenario also suggests that

great-power competition has increased in 2035, and aid may be maintained or even increased in future as a feature of that competition.

The scenario also highlights the South China Sea as a hotspot for great-power tensions and conflict. This is an extrapolation from the present, when numerous nations have overlapping claims of sovereignty in the South China Sea, including China (in some cases in contravention of the rulings of the Permanent Court of Arbitration under the United Nations Convention on the Law of the Sea),[62] and where the US Navy conducts 'freedom of navigation operations' and challenges China's maritime claims, which the US considers excessive and hegemonic. In response, China has accused the US of 'trespassing' in its territorial waters and demanded that the US 'strictly control' its South China Sea military activities in order to avoid 'unexpected incidents'.[63] There have been several near-misses involving US and Chinese forces in the South China Sea, and the risks of inadvertent escalation and miscalculation appear to be increasing,[64] even without the compounding risks associated with climate change.

Population displacement

The 2035 scenario's assumptions about population displacements are extrapolations from historical analysis and projections.[65] Last year alone, climate-related disasters displaced more than 30 million people, the vast majority in the Indo-Pacific region, where the main displacement events were floods, storms, and cyclones.[66] A wide body of research suggests that populations in less developed countries are already migrating to adapt to climate-change impacts, whether that migration is seasonally or after a disaster.[67]

One recent study suggests that the risk of people being forced from their homes by flooding will increase by 50% for each additional degree of warming.[68] The Indo-Pacific region accounts for over 70% of the global coastal population living below 10 metres of elevation, while simultaneously experiencing the world's highest relative sea-level rise. In much of maritime Southeast Asia, particularly Indonesia, as referred to in the scenario, sea level is rising four times faster than the global average, placing hundreds of millions at risk in coastal regions.[69] Analysis suggests that 1-in-100-year extreme floods will become annual events in a matter of decades.[70] Particularly for low-lying island nations, such as Tuvalu, Kiribati, and the Maldives,[71] sea-level rise is an existential threat.[72] Those island countries that can do so are already moving villages to higher ground to avoid the rising seas.[73]

High regional exposure to climate hazards

The rationale for the 2035 scenario's assumptions about the Indo-Pacific's exceptional exposure to climate hazards has been provided in the various sections above. The scenario makes particular mention of an 'atmospheric blocking event' linked to disruption of the jet stream that triggers significant, relatively simultaneous hazards across different regions. Such an event has occurred previously.[74] Ascertaining whether the phenomenon is linked to climate change is currently an active area of scientific research,[75] although much research suggests that such blocking events will increase as the climate continues to warm.[76]

Implicit in the 2035 scenario is the assumption that climate-change disruptions will stretch the capacity of governments and institutions; cause social, economic and political dislocations; and exacerbate tensions between countries, with significant consequences for regional security. The considerable evidence base suggests that those assumptions are well founded.

Notes

1 The editors wish to thank Professor Mark Howden, Director of the Institute for Climate, Energy & Disaster Solutions, The Australian National University; Dr Jacob Schewe, FutureLab Leader, Potsdam Institute for Climate Impact Research; and Janani Vivekananda, Head of Climate Diplomacy and Security Programme, Adelphi (Berlin) for their comments on earlier drafts of the scenario.

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Part 2
Human security and climate change in 2035

2. Food security

Chase Sova and Kate Milliken

The Indo-Pacific region is home to almost half of the world's chronically hungry people and some of the food systems at most risk from the impacts of climate change.[1] By 2035, these impacts on food production are severe, producing widespread food insecurity, mass migration, instability and geopolitical transitions in the region. We've learned that the relationship between climate change and political, economic and social unrest throughout the region and globally often runs through food systems. The region—and the world—were ill-prepared for the onslaught of climate change and its impacts on food security. In 2021, there were already more than 811 million people suffering from undernourishment around the world, and more than half of them were in Asia.[2] While the prevalence of undernourishment was highest in places such as sub-Saharan Africa (21% of the population), the Indo-Pacific led the world in the total number of hungry people.

For most of human existence, food security has been defined in terms of production: is there enough food to go around? In 1996, the global community came together at the World Summit on Food Security based on a more comprehensive definition that spoke not only to available calories, but to peoples' ability to afford food and to the food's nutritional quality. Today, food security is commonly defined as being achieved 'when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life'.[3] In that definition, food security comprises four unique 'pillars': food availability, accessibility, utilisation and stability. It's helpful to consider food security in the Indo-Pacific region today—and in the context of the 2035 scenario—through this framework.

Food availability

Today, the world produces more than enough food to go around. On average, more than 3,000 kilocalories of food are produced for every child, woman and man on the planet—more than is needed to meet dietary minimums.[4] Notwithstanding downward revisions due to extreme weather in major 'breadbaskets' in 2021, global cereal production (wheat, rice, maize) is still expected to reach record levels this year.[5] Globally, the most commonly traded foods, including maize, wheat and rice, are grown in an increasingly small number of highly productive monoculture breadbaskets.[6] In the decade leading up to 2035, global agricultural production continues on this trajectory, leaving the global food system vulnerable to disruptions in those major production centres and heavily reliant on trade to distribute calories.

Agriculture is highly vulnerable to the impacts of climate change, perhaps more than any other sector. Across much of the developing world, including many producers in the Indo-Pacific, food is produced in rain-fed systems without reliable access to irrigation. Those systems are highly sensitive to changes in rainfall patterns, temperature and climate-related extreme events.

Climate and crop modelling, in just one example, suggest that a 1°C rise in mean temperatures in the South Asian region will result in the loss of 4–5 million tonnes of wheat (almost 5% of total production in the region)—a crop that's highly sensitive to increased temperatures.[7] Temperatures are already rising fastest in the Asia–Pacific, and the region is the among the most susceptible to extreme weather events.[8]

The Indo-Pacific is especially vulnerable to the impacts of sea-level rise on agricultural production. According to the IPCC, the rate of sea-level rise in recent decades is already triple that of the period between 1901 and 1971.[9] This has special consequences for the myriad small island developing states in the Indo-Pacific, the economies of which rely heavily on agriculture and fisheries. Agricultural production on the Pacific islands is already falling in the face of this and other climate-related threats, and at least a third of the Pacific island region is already living below the poverty line.[10] By 2035, entire Pacific island nations and their agricultural systems will be submerged.

Climate change will also disproportionately affect the Mekong Basin because of salinisation of freshwater and more frequent flooding in countries such as Cambodia, Thailand, Laos and Vietnam. In that region, some 70% of people rely on agriculture for their livelihoods.[11] Countries relying on a predictable and reliable monsoon rainfall for their crops (such as India and Nepal) will also suffer disproportionately in the coming decades. In 2019, the monsoon in India lasted a month longer than usual and was accompanied by eight tropical cyclones in one of the most active cyclone seasons in the northern Indian Ocean. By 2035, the South Asian subtropical monsoon is triggering extreme flooding due to a powerful La Niña. In Bangladesh, meanwhile, almost a quarter of the country's territory is inundated each year from rainfall, cyclones and sea-level rise. In extreme years, more than half of the country is affected, destroying crops and agricultural land.[12] According to research by the UN World Food Programme, *boro* (monsoon) rice production in the country could fall by as much as 20% by the 2030s, increasing food insecurity by nearly 88%.[13]

There are also lingering questions about food availability in the face of climate change due to rising sea level impacts on major food exporting and importing countries' port infrastructure. Most food in 2035 is still moved by boat. Common choke-points in the maritime food trade include heavily trafficked (or politically contested) straits and canals and the ports of food exporting and importing nations. In the Persian Gulf, for example, on the western edge of the Indo-Pacific, arid growing conditions naturally prevent Gulf Cooperation Council (GCC) states from producing enough to feed their people. With income from oil, GCC states have long relied on food imports, and their strong foreign currency reserves have generally protected them from vulnerability to food price risk. They're vulnerable to availability risk, though, or the inability to obtain food even if they have sufficient funds to purchase it.[14] This usually occurs because of supply-chain problems. According to researchers at Emerge85 and the RAND Corporation:

> Much of the grain imported by [GCC] countries passes through one of six maritime chokepoints: In 2015, for example, more than half of Oman's wheat imports passed through the Suez Canal and the Strait of Bab Al Mandab, and in that same year, nearly 90 percent of the UAE's wheat imports passed through the Strait of Hormuz.[15]

Blockages or slowdowns in ports and canals can have devastating impacts on global food security. For example, in March 2021, a six-day obstruction in the Suez Canal by a grounded ship prevented US$10 billion in products (including crops and livestock) from moving through the canal each day and caused many ships to incur an additional 10-day journey between Western Europe and East Asia around the Cape of Good Hope.[16] Climate change, especially climate-related extreme events such as typhoons and hurricanes, will increase the likelihood of disruptions in major maritime choke-points and sea-level rise will damage coastal infrastructure such as ports and harbours.

Research has demonstrated that, without adaptation to climate change through enhanced food trade, as many as 73 million more people will experience hunger globally by 2050.[17] By 2035, the increase in climate-related extreme weather events and sea-level rise produce supply-chain disruptions in global food trade, closing flooded and damaged ports for extended periods and affecting food access through price increases and empty shelves in local markets.

Food access

Food can be out of reach to people because of cost, even while markets and store shelves are full. Climate change will affect agricultural production, but it will also reduce food accessibility through price increases. Our global food system is complex and interdependent—even more so by 2035. International trade in food commodities continues to grow year on year. By 2021, enough food was traded annually to feed approximately 2.8 billion people.[18] Food trade is especially important in countries that rely heavily on imports to feed their populations. Population in the Pacific islands, for example, has grown fourfold over the past half century.[19] As those populations urbanise, food consumption patterns are shifting away from traditional root crops towards higher value and processed foods that must be imported. In this setting, production shocks in one part of the world can dramatically affect food prices in another. One author refers to this as the 'globalization of drought'.[20]

We've seen evidence of this in recent years. In the 2007–08 global food price crisis, for example, the price of staple commodities rose dramatically over a short period as a result of climate-related production shocks and trade protectionism.[21] That resulted in civil unrest in nearly 40 nations and the toppling of at least one government.[22] Just three years later, production shocks in major wheat-growing regions in China, Russia and Argentina were linked by some researchers to instability across the Middle East and North Africa during the Arab Spring in 2011.[23] As noted by the authors of one study on food-related instability:

> Food price spikes, price uncertainty and price volatility have all been linked to the onset of social unrest, usually in the form of demonstrations or riots. This most commonly occurs in urban areas, with food products of cultural significance, and among countries with a strong reliance on agricultural imports.[24]

The 2032 global food security crisis sees food prices for major staple crops, especially rice, skyrocket. With rapid urbanisation in the Indo-Pacific, severe hunger is becoming more prevalent in major cities, posing new risks of instability. Food prices play an important role in

the vicious feedback loop between food insecurity and conflict. A study from 2020 predicts that a plate of food—a simple meal of rice and beans, for example—would cost the average American almost US$400 if they paid the same percentage of their income for that meal as someone living in South Sudan—a place ravaged by violent conflict.[25]

The link between climate change, food insecurity, migration and instability is complex, but a straighter line between them can be drawn in 2035. According to research by the World Bank, as many as 200 million people may be forced from their homes because of the impacts of climate change by 2050.[26] Southeast Asia and the Pacific region will make up almost half of that number, and Bangladesh alone will have nearly 20 million internal migrants. In a vicious feedback loop, conflict produces food insecurity and food insecurity produces conflict. Instability is a major driver of food inaccessibility, often through food price spikes or 'conflict premiums'. By 2030, it's estimated that up to two-thirds of the world's extreme poor could live in areas affected by fragility, conflict and violence. In those places, vulnerable populations will face the additional burden of rising food costs.

Food utilisation

Achieving food security also requires people to consume the right mix of micro- and macronutrients. By 2020, one in three people were unable to afford a healthy diet, and more than 2 billion people suffered from so-called 'hidden hunger', lacking key micronutrients in their diets.[27] Nearly two-thirds of people who lacked access to a healthy diet lived in Asia and the Pacific.[28] The global food system had produced a world facing the double burden of undernourishment and obesity, often side by side in the same countries. The Pacific island region was already facing some of the highest rates of obesity in the world, with rates of over 50% for adults in Samoa and Tonga.[29]

Threats to fisheries from climate change will affect protein consumption in the Pacific islands. In rural areas, in particular, fish accounts for most of people's protein, as those populations have limited access to imported meat.[30] Many rural Pacific islanders rely on coastal subsistence fishing to feed their families, but increased cyclone activity risks destroying fishing infrastructure, and a warming ocean results in critical habitat loss and coral bleaching, threatening livelihoods and food security in the region.

There's also considerable risk that climate change will reduce the nutritional density of commonly consumed foods. In settings with especially high concentrations of atmospheric carbon dioxide (CO_2), iron and zinc content in plants could fall by as much as 17%, according to one study, accompanied by an increase in starch and sugar production in plants. That change in nutritional quality could cause an additional 175 million people to experience zinc deficiency and 122 million to experience protein deficiency.[31] General food insecurity among children has also been connected to powerful El Niño events. For example, researchers have demonstrated that the 2015 El Niño probably led to an additional 6 million children globally suffering from chronic undernourishment.[32]

Food stability

An important fourth element for achieving food security is to ensure that each of the other three pillars are achieved without disruption. With climate change, the stability of food systems is greatly challenged. As noted in the IPCC's Sixth Assessment report released in August 2021, the world was already committed to experiencing 1.5°C warming relative to pre-industrial levels of CO_2, even under the best-case scenario for global greenhouse gas emissions.[33] This was already translating into increased frequency and magnitude of climate-related extreme events (droughts, floods, tropical storms)—a trend that accelerates towards 2035. In fact, extreme events have already more than doubled in frequency over the past 25 years. As researchers have observed, while the world experienced approximately 100 climate-related extreme events in the early 1990s, that number had already doubled by 2018.[34] Such events have severe and immediate impacts on food insecurity. Climate extremes were responsible for driving the most severe forms of hunger in at least 15 countries in 2020.[35] In this scenario, by 2035, climate-related extreme events have led to the displacement of hundreds of millions of Indonesians (due to sea-level rise and tropical storms) and the relocation of the entire population of at least one Pacific island nation.

These major geopolitical events had been foreshadowed in earlier decades. Globally, at least 4.4 billion people were injured or displaced because of climate-related extreme events between 1998 and 2017.[36] In 2013, for example, Typhoon Haiyan hit the Philippines, destroying hundreds of thousands of hectares of farmland and causing losses to the agricultural sector approaching US$200 million.[37] Many coconut trees in the Philippines' 3.6-million-hectare production area were damaged by the storm and will take decades to recover.[38] In 2021, in the extreme western reaches of the Indo-Pacific, the island nation of Madagascar was the only country experiencing famine conditions that were not driven by human conflict. Consecutive years of extreme drought had caused food production in the south to fall to one-third of its typical five-year average.[39] More than 1 million people found themselves in need of humanitarian assistance. In places like the Indo-Pacific, where large numbers of people depend on rain-fed agriculture, over 80% of a drought's economic impact is felt in the agricultural sector.[40]

Climate change is affecting food systems and societies that are already facing multiple stressors. The Covid-19 pandemic of 2020 forced millions of people around the world into food insecurity, many for the first time. The pandemic revealed critical vulnerabilities in the global food system, disrupting global food supply chains, eliminating the equivalent of 255 million full-time jobs,[41] reducing foreign reserves of countries relying on tourism and raw-material exports and generally grinding the global economy to a halt. In a world already suffering from half a decade of slipping progress against global hunger, by some estimates the number of people requiring food assistance to survive jumped from 135 million to 270 million in a single year.[42] By late 2021, famine was threatening the lives of more than half a million people, and 41 million others in 43 countries were close on their heels.[43] This trajectory continues through to 2035, compounded by a host of food-related climate shocks assaulting the Indo-Pacific and the world.

A food systems future: possible solutions from 2021

In 2015, the world signed up to achieving a set of Sustainable Development Goals (SDGs) by 2030. SDG 2 focused on ending hunger by that year. As the trajectories in the Indo-Pacific foretell, climate change presents major challenges to achieving the goals, with run-on effects for security across the region. Global projections hold that 77 million more people will be food insecure globally by 2050 without necessary investment in climate-change mitigation and adaptation.[44] Such impacts require transformational, systems-level change to address those challenges.[45] In September 2021, the UN Secretary-General convened the Food Systems Summit to set the stage for transforming such systems to achieve the SDGs within the next decade. This systems-level thinking reflects various paradigm shifts that have been identified as necessary to achieve transformational change at the level needed for adapting to the impacts of climate change and enabling greater climate resilience among individuals, communities and governments. The international community is slowly moving from a myopic focus on production increases brought about through vast monocultures and synthetic inputs to more holistic changes to the global food system that embrace more regenerative forms of agriculture and take the entire food system—from farms to processing to transportation to diet and behavioural change—into account. The food system of tomorrow must nurture both people and planet alike.

We see this in international negotiations such as the UN Framework Convention on Climate Change (UNFCCC) and its annual Conference of the Parties negotiations. Over the 2010s, thanks to research on and the dissemination of climate-smart agricultural practices, agriculture is increasingly the subject of global debate about greenhouse gas emissions reductions. The debate has been challenging, given that many low-income nations rely heavily on agriculture for rural employment and GDP and thus have been hesitant about adopting major changes to their food production regimes that could negatively affect their economies. That position is slowly changing as the evidence base grows for the benefits of adopting climate-smart agricultural practices, and as industrial nations increase their international assistance for climate-change adaptation. The UNFCCC adopted the Koronivia Joint Work on Agriculture in 2017—the first of its kind dedicated to the sector—and in the latest round of nationally determined contributions to the Paris Climate Agreement of 2015 at least 70% of countries prioritised the adaptation of cropping systems.[46] This includes actions such as the adoption of climate-tolerant crop varieties, changes to soil management (such as reduced tillage, covering crops and agroforestry) and water management strategies, but also wider socioeconomic and policy support within the sector.

The demand for humanitarian food assistance will continue to rise by 2035 in the Indo-Pacific without such necessary investments in food-system transformation. Owing to the increase in global hunger as a result of climate extremes and conflict, various multilateral and non-government organisations having already begun to adopt measures to reduce costs and extend impact. For example, the UN World Food Programme (WFP), which is the largest global humanitarian organisation fighting hunger, has adopted strategies such as forecast-based financing to combine sophisticated weather forecasts to enable food and other assistance to

be distributed before a disaster strikes. In 2020, working with the Bangladesh Government, the WFP used cellphones to distribute cash transfers valued at US$53 each to 145,000 people four days before floodwaters hit. That was a full 100 days before a similar response had been mounted in 2019 and allowed families to evacuate themselves and their livestock,[47] resulting in lives saved and big cost savings. This work is made possible by flexible, multi-year funding provided to humanitarian organisations such as the WFP by donor governments.

To protect against food insecurity and instability and to promote systems change, investments in social protection systems that provide a safety net for vulnerable populations are important no-regret interventions in the face of climate change. By some estimates, fewer than 20% of the poorest people in developing countries are covered by social assistance programs.[48] Yet such programs help countries recover more quickly from shocks and prevent people from falling into poverty in the first instance, especially women and girls, who are more likely to suffer from gender-based violence, adverse mental health effects and income loss in the face of crisis.[49] For example, the Philippines' Social Amelioration Program was scaled up in response to the 2020 Covid-19 pandemic and reached 18 million low-income families with cash transfers. Such social protection programs are increasingly being seen as entry points for introducing wider interventions that complement the food-security and poverty-reduction outcomes, and are potentially scalable to support many of the most vulnerable populations within a country. With seed funding, technical support from international donors and more innovative engagement with the private sector, many low-income countries are able, through domestic resource mobilisation and the prioritisation of social protection in government agendas, to maintain and expand the services provided by such programs.

This includes innovative climate and resilience interventions but also insurance mechanisms, which are becoming more sophisticated. Parametric insurance allows payouts to be triggered by predefined indices, such as rainfall or vegetation coverage determined through satellite imagining and weather stations, and can be offered from the micro (individual) level through to macro tools such as sovereign-risk financing. The main benefit of the payouts is that they can be offered quickly in the face of disaster. There are opportunities to engage more public–private partnerships in this space, including by governments expanding their regulatory environment to incentivise more inclusive risk finance tools for the private sector, exploring more smart-subsidy arrangements that will allow more food-insecure populations to access those financial instruments, and finding insurance linkages to government safety-net programs.

Embracing such partnerships and technologies is also important for climate-smart agricultural approaches that will expand production and incomes. Enabling smallholder and women farmers to have access to the knowledge and resources to introduce drought-tolerant crops and livestock that can better withstand heat, employ conservation agricultural practices, soil-management planning and agroforestry, invest in water-efficient irrigation techniques and diversify into other non-agricultural livelihood options are all critical activities that will improve people's climate resilience and food security in the Indo-Pacific. Efforts to improve human capital, including education and reducing gender inequality, should magnify outcomes.

Food security in the face of climate change in the Indo-Pacific to 2035 can be maintained—even improved—if social protection systems are expanded, climate-smart practices are adopted, risk is properly distributed and transferred, and support to historically marginalised groups is prioritised. Covid-19 has underscored the need to expand each of those efforts and to ensure the free movement of agricultural trade to smooth out shocks experienced in a highly interdependent world. Because food security is likely to face unprecedented challenges from climate extremes in the decades to come, adapting our global food system to the impacts of climate change will require transformative solutions, not mere tinkering at the margins.

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3. Water security

David Michel

It's the year 2035. Decision-makers across the Indo-Pacific confront a host of overlapping socio-economic, ecological and policy challenges as they seek to ensure their societies' water needs are met. Growing populations and economies are driving mounting water demand, even as environmental degradation and unsustainable consumption practices increasingly stretch available freshwater resources. Many areas now experience escalating water stress as rivers and groundwater aquifers bump against the limits of their renewable capacity. Continuing global climate change compounds the pressures on regional water supplies, shifting precipitation patterns and worsening extreme events such as storms, floods and droughts.

Many Indo-Pacific nations have significantly strengthened their water-management policies and capabilities in recent years, improving water and sanitation services, pioneering technological innovations and improving efficiency and conservation. Yet water challenges remain substantial, crimping agricultural production, curbing electrical power generation and cutting into industrial output around the region. Where different countries or communities rely on the same water sources, shortfalls between rising demand and diminishing supply are spurring conflicts among competing consumers. Increasing frictions over water availability, access and allocations pose substantial risks to regional prosperity and security. Policymakers at all levels, from the local to the international, must continue working to implement effective water policies and cooperative resource-governance mechanisms to enhance societal resilience and ensure sustainable water security.

Diverse water resources, disparate water availability

Stretching from Southern Africa to Northeast Asia, the Indo-Pacific is a vast and diverse region encompassing considerable disparities in water supplies and distribution. Water managers frequently gauge water resources in terms of the Falkenmark index, which is a measure of annual renewable freshwater availability per capita. On average, every individual requires 1,700 cubic metres (m^3) of water per year to meet all their needs—from drinking, cooking and washing to the water incorporated in food and other products. Where annual renewable water availability falls under 1,700 m^3 per person, recurring water stress can notably hamper economic development and public health. Below 500 m^3, absolute water scarcity imposes significant constraints on societal wellbeing.[1] In the Indo-Pacific, many nations enjoy an abundance of water, comfortably exceeding the Falkenmark threshold. Numerous others, however, face growing strains. Several possess less than 100 m^3 of renewable water per person (Table 1). Around the region as a whole, nearly every country on the Indian Ocean rim from South Africa through the Persian Gulf to India, as well as much of China, now faces chronic per capita water stress. Many endure absolute water scarcity.[2]

Table 1: Indo-Pacific water resources, stress and dependency

	Total renewable water resources per capita in 2030 (m^3/inhabitant/year)	**Water stress** (withdrawals as % of total annually available renewable resources) 2018 or latest value	**Dependency ratio** (% of total renewable water resources originating outside the country)
Afghanistan	1,358	54.76	28.72
Australia	17,461	4.66	0
Bahrain	58	133.71	96.55
Bangladesh	6,855	5.72	91.44
Bhutan	92,527	1.41	0
Brunei Darussalam	18,047	3.47	0
Cambodia	25,350	1.04	74.67
China	1,939	43.22	0.96
Djibouti	269	6.33	0
Egypt	476	141.20	98.26
Eritrea	1,725	11.18	61.72
Ethiopia	842	32.36	0
India	1,271	66.49	30.52
Indonesia	6,748	29.70	0
Iran	1,478	81.29	6.77
Iraq	1,790	47.14	60.83
Japan	3,561	36.46	0
Kenya	462	33.24	32.57
Kuwait	4	3,850.00	100.00
Lao PDR	40,542	4.77	42.91
Madagascar	9,460	11.26	0
Malaysia	16,069	3.44	0
Maldives	58	15.57	0
Mauritius	2,159	21.48	0
Mozambique	5,271	1.75	53.80

	Total renewable water resources per capita in 2030 (m^3/inhabitant/year)	**Water stress** (withdrawals as % of total annually available renewable resources) 2018 or latest value	**Dependency ratio** (% of total renewable water resources originating outside the country)
Myanmar	19,973	5.80	14.13
Nepal	6,295	8.31	5.70
New Zealand	63,213	8.05	0
Oman	236	116.70	0
Pakistan	939	118.20	77.71
Papua New Guinea	74,797	0.13	0
Philippines	3,872	28.66	0
Qatar	17	431.00	3.49
Republic of Korea	1,362	85.22	6.96
Saudi Arabia	61	1,000.00	0
Seychelles	0	N/A	0
Singapore	95	81.85	0
Somalia	694	24.53	59.18
South Africa	779	63.56	51.35
Sri Lanka	2,397	90.79	0
Sudan	684	118.70	96.13
Syria	630	124.40	72.36
Tanzania	1,216	12.96	12.75
Thailand	6,235	23.01	48.81
Timor-Leste	5,219	28.27	0
United Arab Emirates	14	1,667.00	0
Vietnam	8,488	18.13	59.35
Yemen	58	169.8	0

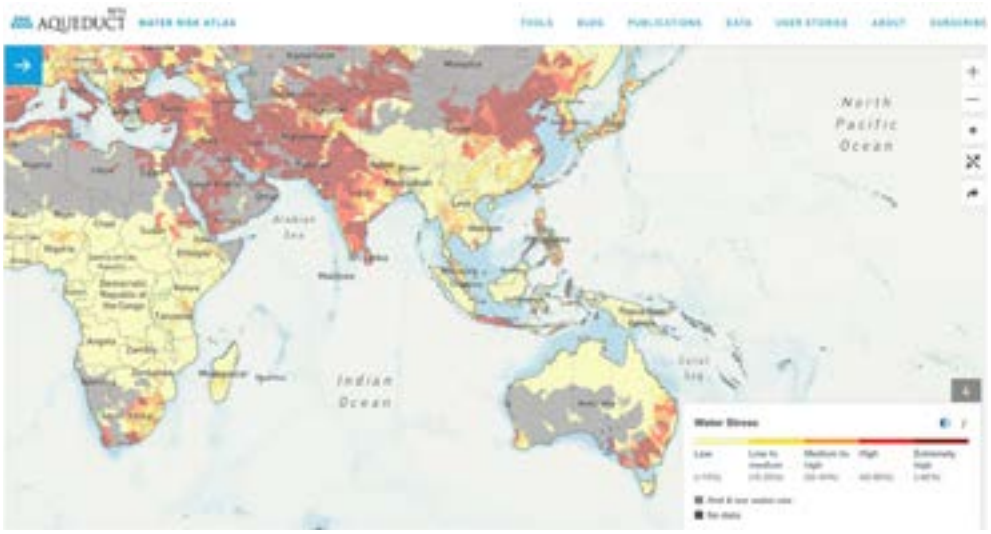
Source: FAO AQUASTAT. Water resources per capita in 2030 calculated by author with 2030 population projections from UN Department of Economic and Social Affairs, Population Division, *World population prospects 2019: data booklet*, UN, New York, 2019.

In 2035, throughout the Indo-Pacific, climbing water claims have outpaced renewable supplies. In several major river basins—including the Ganges, Indus, Nile, Tigris–Euphrates and Yellow rivers—yearly water withdrawals for irrigation, industry and municipal use nearly equal or even exceed long-term river flows and ecosystem needs.[3] With little to no spare capacity left, people in those basins have scant margin for manoeuvre. Rising demand can be accommodated only by cuts, trade-offs or increased efficiencies among contending users. Often overlooked in water-resource assessments, groundwater sources suffer the same pressures as surface supplies. In the Arabian Peninsula, central Iran, Pakistan, India and northern China, farmers have sold off or abandoned planting on thousands of hectares of agricultural land in the past two decades as water tables in overexploited aquifers have dropped below economically accessible levels.[4] Groundwater depletion likewise imperils many urban water supplies. In Indonesia, for example, excessive groundwater extraction to feed municipal water systems propels the land subsidence projected to permanently inundate 95% of coastal north Jakarta by 2050, just 15 years away.[5] (Land subsidence was similarly an underlying cause of the 2029 Manila disaster, in which 307 people perished in an office tower collapse.)

Humans significantly affect freshwater systems not only through the resources they remove from them but also by the pollutants they release into them. Agricultural and human waste disposal load surface and groundwater with pesticides, fertilisers and microbial pathogens. Industrial, mining, domestic and other activities sully waterways with synthetic chemicals, heavy metals and other contaminants. Apart from in OECD member countries and rich Gulf states, 50% to 100% of the household and industrial wastewaters generated in Indo-Pacific countries are dumped untreated.[6] In 2035, pollution levels for contaminants such as nitrogen and phosphorus exceed natural absorption capacities in all the major basins of South Asia, Southeast Asia and East Asia. By mid-century, water pollution levels will surpass absorption capacities in nearly every major river system in the Indo-Pacific rim.[7] Crucially, pressures on water quantity and quality interact. Diminishing water quantities boost the concentration of any pollutants present, eroding water quality. Decreasing water quality effectively lowers available water quantities, as some sources become too degraded for certain uses.

Throughout the Indo-Pacific, escalating water demands are squeezing renewable resources, exacerbating another common measure of water stress—the ratio of demand to available renewable supplies. In several countries, total water use outstrips renewable water reserves as consumers deplete non-renewable groundwater stores. All told, some 2.5 billion people around the region live under chronic water stress in 2035, as annual water withdrawals exceed 40% of total annual renewable supplies, leaving scant room for seasonal fluctuations and natural ecosystems. This is an increase of 1 billion people since 2020 (Figure 1).[8]

Figure 1: Water stress in the Indo-Pacific in 2040 under a business-as-usual scenario of steadily rising global carbon emissions and global mean temperatures increasing by 2.6–4.8°C relative to 1986–2005 levels



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Rising demands, increasing challenges

Strains on freshwater resources are rising throughout the Indo-Pacific. In the coming decades, the greater Indo-Pacific region will add another 600 million people, growing from 5.6 billion inhabitants in 2030 to 6.2 billion in 2050.[9] Global GDP is projected to expand from US$142 trillion to US$205 trillion over the same period, including a near 60% surge in the major Indo-Pacific economies from US$72 trillion to US$114 trillion.[10] Water needs will climb with demographic and economic growth. Larger, richer populations typically demand and can afford greater water use. Around much of the region, water withdrawals have been ballooning, propelled by surging demands for manufacturing, power production and domestic use. For example, domestic demand in India more than doubled from 2010 to 2030 and is projected to soar by 50%–100% again by 2050. In China, models project industrial water withdrawals increasing by one-quarter to one-third between 2035 and 2050.[11]

More important to future demand than the water required for industry, power and municipal needs is the water required to feed growing populations. With higher incomes, dietary preferences and possibilities shift, increasing demand for more water-intensive foods such as dairy products, eggs and meat. Agriculture accounts for some two-thirds of global water withdrawals, rising to 90% or more in many Indo-Pacific nations.[12] Although a number of African and West Asian countries around the region have succeeded in modestly increasing irrigation efficiencies in recent years, farmers in South and East Asia have not.[13] Agricultural water requirements are currently on pace to swell another 7% in Asia and 50% in southern and

eastern Africa from 2030 to 2050. Putting all water uses together, water demand around the Indo-Pacific is expected to grow by some 10% in the 15 years to 2050.[14]

Global climate change is exacerbating the stresses on regional water resources, affecting both demand and supply. As global warming has topped 1.5°C above pre-industrial averages, warmer weather patterns are pushing up water demand for industrial cooling and domestic use. Crop yields and agricultural water productivity are slumping as temperatures rise. The UN Food and Agricultural Organization now estimates that meeting the Indo-Pacific's increasing agricultural water demands will require an additional 40% to 100% more water than would have been needed in the absence of worsening climate impacts.[15]

At the same time, continuing global warming is accelerating the Earth's hydrological cycle, increasing both precipitation and evaporation and disrupting fundamental hydro-meteorological mechanisms. Elemental patterns and processes such as the timing and amount of rainfall and snowfall and the onset of the Pacific and Indian Ocean monsoons are shifting, scrambling seasonal availability and shuffling the geographical distribution of crucial water supplies.[16] Long-term shifts in the volume, timing, location and form of precipitation (whether it falls as rain or as snow) could upset the future freshwater flows available to communities and ecosystems across the region. By 2050, climate change is projected to significantly affect river flows in every basin and alter recharge rates in groundwater aquifers throughout the Indo-Pacific.[17]

In addition to exerting chronic pressures on water resources, climate change is boosting the incidence of acute water disasters. With a greater proportion of precipitation concentrated in more intense events, many areas suffer both periods of torrential rainfall and heightened flood threats interspersed with longer, harsher dry spells.[18] Extreme hydrological events can damage or degrade the water supply and sanitation infrastructure on which society depends. The La Niña event of 2035 highlights the dangers. When Cyclone Iqbal, fuelled by record high sea-surface temperatures, swept over Oman and into the Persian Gulf earlier this year, the resulting flooding inundated and interrupted electrical power to several vital desalination plants, cutting water services to hundreds of thousands in Dubai, Qatar and the United Arab Emirates.[19] A further increase in global climate change to 2°C would double the proportion of the Indo-Pacific population annually exposed to significant flooding, quadruple the population exposed to drought, and double the population exposed to crop failures.[20]

Growing water insecurity risks

The UN defines water security as:

> the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability.[21]

If people lack secure access to sufficient supplies of safe water, the consequences can be dire. Around the Indo-Pacific as a whole, roughly half of the region's entire labour force work in heavily water-dependent sectors such as agriculture, mining and fisheries.[22] Increasing water insecurity imperils their livelihoods and the economies and communities they support. Yet the human risks are more harrowing.[23] The World Health Organization estimates that unsafe and insufficient water account for 9.1% of the global disease burden and 6.3% of all deaths. Without substantial policy changes to improve water management and adaptation to global warming, the World Bank calculates that by 2050 water-scarcity impacts could depress GDP by some 6% to 14% across the Indo-Pacific, from the Horn of Africa, through the Middle East to South Asia and East Asia.[24]

Beyond jeopardising water-reliant livelihoods, rising water insecurity endangers an array of services and benefits that water resources support. Vital water uses are themselves interconnected. Water managers characterise these interdependencies as constituting the water–food–energy nexus.[25] It takes water to produce food and energy. It takes energy to supply food and water. And many food crops can be turned into energy as biofuels. As a result, water, energy, food resources and management policies interact, and water insecurity can in turn compromise food and energy security.

The 2032 global food crisis dramatically illustrated that interdependence. Drought in the Mekong Basin that year devastated rice harvests in Thailand and Vietnam, the world's second and third largest exporters.[26] Nervous importers quickly turned to India, the number 1 exporter, to secure continuing supplies. With elections around the corner, however, New Delhi soon introduced price controls and export restrictions to protect domestic consumers, severely rattling global grain markets. The resulting rush to purchase supplies, fanned by fears that the import cost would be higher still tomorrow, fuelled global price spikes that rippled through many agricultural commodities. Popular dissatisfaction boiled over in many places. More than 40 countries, including several Indo-Pacific nations, suffered outbreaks of civil disorder, from violent protests to deadly riots with scores of fatalities.[27]

Such crises highlight all too clearly the costs of potentially wrenching collisions between growing water needs and increasingly stretched water resources. Around much of the Indo-Pacific, the collective policy challenges are rendered even more acute by the importance of common water resources to regional water supplies. Except for the region's island nations, every country of the Indo-Pacific shares one or more transboundary rivers, groundwater aquifers, or both, with one or more of its neighbours.[28] Most of the region's major basins, from the Nile to the Indus, Ganges and Mekong, are shared by multiple states. By the same token, many Indo-Pacific countries rely substantially on water resources originating beyond their borders. Bangladesh, Cambodia, Egypt, Kuwait, Pakistan, Sudan and Syria all have 'dependency ratios' above 70% (see Table 1).[29]

Managing shared water supplies, particularly under conditions of climate change, can pose thorny problems for collective action. Outside the industrialised states, most Indo-Pacific nations remain ill-prepared for the rising water stresses entailed by climate change. Few possess sufficient water-storage capacities to buffer long-term fluctuations in water availability. Pakistan's reservoirs, for example, hold the equivalent of just 34 days of Indus River inflows.[30]

Likewise, irrigation capacities over much of the region remain both gravely inadequate for a warmer future and often markedly inefficient. Yet building and operating dams and irrigation schemes can alter the resources available to other stakeholders, affecting water flows, ecosystems, fisheries, navigation and disaster risks for water users up and down shared rivers.[31] As a result, water management in many Indo-Pacific basins has engendered multiple water 'security dilemmas'.[32] Measures taken by one community to uphold its own water security are then perceived to undermine the water security of others by shifting the control of water resources and the nature and balance of water benefits and risks between them. As stresses on shared waters grow, the potential risks of conflicts between contending users rise.

Violent clashes between states vying to secure their claims to common water resources remain unlikely, but water conflicts can take multiple forms and pathways.[33] Some parties in shared basins have exercised their power to regulate water supplies via dams and other infrastructure to exert leverage over downstream neighbours.[34] Frictions about water availability, access and development—especially when oriented along ethnic, religious or other social fault lines—can spur civil strife within countries. Refugees fleeing natural catastrophes may spill into adjacent communities, straining local capacities and sparking unrest. And combatants in several of the 21st century's armed conflicts, from Iraq and Syria to Yemen, have deployed water as a weapon of war, flooding or cutting supplies to territory or populations they aim to control.[35]

The ramifications of such water-security risks played out across the Indo-Pacific in the years to 2035. Thus, in South Asia, Pakistan has long believed that each additional Indian installation on the Indus River incrementally increases New Delhi's potential ability to strangle the Pakistani economy. Militant groups such as Lashkar-e-Taiba often threaten to bomb India's dams and threaten war to recapture Pakistan's rightful water.[36] But the 2033 Summer of Terror ratcheted geopolitical tensions to new highs when Pakistani hackers remotely seized control of several Indian dams in the upper Indus, threatening to release waves of floodwaters on Indian communities downstream.[37] Further west, the persistent drought of the late 2020s set Afghanistan and Iran perilously at odds. In a repeat of events at the dawn of the 21st century, Afghanistan responded to the drought by closing the Kajaki Dam on the Helmand River, conserving water for its own use but cutting off flows to Iran. Unlike in the earlier episode, however, Tehran rapidly retaliated, temporarily shutting down the eastern electrical grid connections that supply Afghanistan with a quarter of its power.[38] Just this year, in 2035, during the renewed crisis in the South China Sea, Beijing is alleged to have strongarmed Vietnam and prevented ASEAN from taking a firmer stand, in part by conveying veiled pressures on its downstream neighbours through a purported need to review future operations of Chinese dams in the upper Mekong.

Conclusions: the way forward from 2021

Growing pressures on the Indo-Pacific's collective water resources will increasingly demand that policymakers at all levels pursue greater efficiencies, identify priorities and negotiate trade-offs among contending claims on water use. Much regional water use is excessively wasteful, pushed higher by ill-suited subsidies and perverse incentives.[39] Enhanced

conservation and efficiency can help reduce some of the pressures on shared water supplies that can drive consumers towards damaging competition. Water-scarce Singapore, for example, has piloted water reuse and recycling techniques that diversify its water supply and reduce its dependence on imported water from Malaysia.[40] Many Indo-Pacific nations, however, will need assistance from development partners to help fill substantial gaps in water infrastructure investment and innovation.[41]

Managing shared water supplies sustainably will also require strengthened collaboration across societies, sectors and stakeholders. Integrative governance approaches that promote inclusive and participatory decision-making can increase the effectiveness and legitimacy of collective policy development. The UN Sustainable Development Goals, adopted with the 2030 Agenda, expressly committed the international community to increasing water cooperation and expanding collaborative institutional arrangements.[42] Yet the countries of the Indo-Pacific region have fallen short of that goal. Most of the region's transboundary basins aren't covered by international accords. Where agreements are in place, many don't include all the basin countries. Many don't have dispute-resolution procedures, mechanisms for data exchange or provisions to address varying river flows. Few address groundwater, water quality or minimum environmental needs.[43] Surveys of national water-governance systems report that, although many countries have drawn up integrated policy frameworks, implementation lags, especially in developing states.[44]

As global climate change imposes unprecedented impacts on freshwater supplies even as millions of new consumers inexorably raise demand, Indo-Pacific policymakers must significantly bolster collaborative water-governance capacities. Integrative multilevel cooperation provides the key to managing shared basins where water-security options pursued by one nation can increase the resource risks perceived by others. Resilience strategies that aren't coordinated between countries may prove unable to assure the sustainability of interdependent water systems.

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4. Health security

Kristie Ebi and Kathryn Bowen

Introduction

The magnitude and pattern of the health risks of climate change in 2035 in the Indo-Pacific region will depend on the extent of climate change and on socio-economic development choices.

Rising temperatures, changing precipitation patterns, increases in the frequency and intensity of extreme weather and climate events and sea-level rise are projected to increase the numbers of climate-sensitive injuries, diseases and deaths in the Indo-Pacific. Key health risks include increased morbidity and mortality from heatwaves and other extreme weather and climate events, diseases associated with exposure to poor air quality (including ozone and aeroallergens), effects on the emergence and distribution of vector-, water- and food-borne infectious diseases, health impacts of reductions in food availability and in the nutrient density of food, and the consequences of climate-related migration and conflict.[1] Mental health and wellbeing are also affected. Unfortunately, we haven't seen the required additional significant investment in adaptation and mitigation, which means that the health impacts projected two decades ago are now evident.

People and communities across the Indo-Pacific are differentially exposed to climate-related hazards and disproportionately affected by climate-related health risks. Populations experiencing greater health risks include children, older adults, low-income communities and indigenous communities. Climate change is exacerbating existing health inequities arising from social, economic and environmental factors. Furthermore, many public health laboratories, healthcare facilities and other infrastructures are at risk of damage and disruptions in service delivery during extreme weather and climate events and from sea-level rise and storm surges.

Determinants of the magnitude and pattern of health risks in 2035

Climate-sensitive health risks are determined not just by the hazards created by a changing climate but also by the extent of exposure of populations and regions and their underlying vulnerability. The magnitude and pattern of impacts in 2035 will depend on choices made over the next decade to build climate-resilient and environmentally sustainable health systems.[2]

The IPCC relies on five 'shared socioeconomic pathways' (SSPs) to describe alternative socio-economic narratives for future society in a warming planet.[3] The case studies presented in this chapter discuss selected characteristics of health systems under two of the SSPs that are projected to reach 1.5°C by 2035: SSP 2 and SSP 3. SSP 2 is a world that basically continues current trends, with medium challenges to adaptation and mitigation. In this scenario, there's uneven development and income growth and slow progress in achieving the UN's Sustainable Development Goals. There are some improvements to environmental systems, and energy

and resource use declines. SSP 3 is a world with high challenges to adaptation and mitigation. Countries have turned inward and focus on achieving energy and food security goals rather than global sustainable development, and addressing environmental issues is a low international priority. Worsening inequalities and slow economic development present challenges to effective adaptation and mitigation.[4] SSP 1 is a world aiming for sustainable development; under this SSP, the world isn't projected to reach 1.5°C by 2035, so that scenario isn't considered.

Further, in this volume's 2035 scenario, trade, population displacement and the effectiveness of regional institutions and organisations could continue to affect population health and health systems, exacerbating or ameliorating climate-change impacts, depending on national circumstances.

Projections of the health risks of climate change

Since 2001, a synthesising element in IPCC assessment reports has been a summary of how risks in a particular system could change with additional warming above pre-industrial levels. An evidence-based approach was used to estimate the temperatures at which risk levels increased from undetectable to medium, high and very high from the pre-industrial baseline under three adaptation scenarios.[5] Recent climate change has likely increased risks from undetectable to moderate for heat-related morbidity and mortality, ozone-related mortality, and diseases carries by various species of *Aedes* mosquitoes, such as dengue fever and Zika virus. The synthesis wasn't conducted regionally, but the conclusions for heat-related morbidity and mortality, and diseases carried by the mosquitoes that carry dengue fever, chikungunya and Zika, are relevant to the Indo-Pacific:

- heat-related morbidity and mortality: risks increase from moderate to high at about 1.5°C under SSP 3 and between 1.5°C and 2°C under SSP 2
- diseases carried by *Aedes* mosquitoes: risks increase from moderate to high before 1.5°C under SSP 3 and start at about 1.5°C under SSP 2.

For each, risks are projected to increase as global mean surface temperature increases, and the extent and pace of adaptation are expected to affect the extent of risks.

The following two examples look at how these risks could manifest in the Indo-Pacific region. We then discuss the broad-ranging potential health and wellbeing impacts from sea-level rise, including impacts on mental health, in a brief case study. The health implications of sea-level rise haven't yet been sufficiently projected, but it's a significant risk for many Indo-Pacific countries, particularly low-lying atolls.

Heat-related morbidity and mortality in India

In 2035: The population of India has reached 1.5 billion, roughly in line with the demographic projections. Rapid urbanisation combined with the increased population has placed substantial pressures on the country's large settlements. India has recently endured a record-breaking run of heatwaves. For five years, the central state of Maharashtra has experienced a sharp increase

in deaths and illness because of the record-breaking heat. The country is experiencing hotter days more frequently. The relentless heatwaves are taking their toll on those who are most vulnerable—the young, the elderly, those with chronic diseases and those who can't shelter from the heat.

Under SSP 2: India, like many countries in the Indo-Pacific region, has been unable to fully implement adaptation responses to protect its citizens from the impacts of climate change, such as the heatwaves. While there have been several national assessments of the health impacts of climate change—including heatwaves—the implementation of those assessments at the local level has been insufficient. There are a range of reasons for this, including insufficient support from regional partners to assist implementation processes, complex governance arrangements across the states of India, and slow international funding support.

Under SSP 3: There have been very limited investments in heat-related adaptation responses, leaving the population essentially unprepared for the increases in the frequency and intensity of heatwaves. Therefore, heat-related mortality has been rising sharply, particularly among the poor and marginalised who are without access to cooling. Regions of India are becoming too hot for outdoor labour during summer months, putting a drag on the economy.

Dengue outbreak in the Pacific

In 2021, the Indo-Pacific was braced for another severe outbreak of dengue fever; the only question was which countries would be most affected. Dengue is a mosquito-borne viral infection found in tropical and subtropical countries worldwide, mostly in urban and semi-urban areas. The virus responsible, dengue virus (DENV) has four serotypes that can each infect an individual; there's very limited cross-immunity. Most DENV infections are mild, but DENV also can cause acute flu-like illness with severe bone and joint pain (dengue fever is also called 'breakbone fever'). An infection with one serotype increases the likelihood that a subsequent infection can result in the much more serious dengue haemorrhagic fever that has a higher mortality rate. Dengue is the leading cause of serious illness and death in some Asian countries. The mosquito genus that can carry DENV, *Aedes*, is widespread in Asia and the Pacific, and climate-change-related impacts on ambient temperature, rainfall and humidity are increasing the geographical range of the mosquito and the seasonality of the disease. The disease is seasonal in most countries.

Before 1970, only nine countries had experienced severe dengue epidemics. The numbers of dengue cases reported to WHO increased eightfold in the first two decades of this century, from 505,430 cases in 2000 to more than 2.4 million in 2010 and 5.2 million in 2019.[6] Reported deaths increased from 960 in 2000 to 4,032 in 2015. These numbers are certainly underestimates. Modelling studies estimate that there are 284–528 million infections annually, of which 67–136 million infections manifest clinically.[7]

The largest number of dengue cases ever reported was in 2019, when 101,000 cases were reported in Bangladesh, 131,000 in Malaysia, 420,000 in the Philippines and 320,000 in Vietnam.[8]

In 2020, the Pacific was hit with a dengue outbreak during the Covid-19 pandemic and weeks after Tropical Cyclone Harold caused flooding and infrastructure damage.[9] Fiji reported 700 DENV infections. The outbreak in the Marshall Islands that started in 2019 and continued through 2020 was the worst ever recorded in the nation's history, with over 3,500 infections.[10] Travel bans to outer islands helped only temporarily. High weekly case numbers overwhelmed fragile health systems.

In 2035: Since the 2019–20 dengue outbreaks, health systems in Pacific island nations have tried enhancing preparedness for outbreaks by increasing understanding among health professionals of the diagnosis, treatment and prevention of dengue; conducting vulnerability and adaptation assessments; designing and implementing early-warning and response systems; improving mosquito and virus surveillance and vector control; and improving healthcare systems and services. The 2035 La Niña is increasing the risks for islands in the Southwest Pacific that usually experience higher than normal rainfall, such as Fiji, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, the southern Cook Islands, Tonga and Vanuatu.[11] Associated storms are disrupting trade and affecting health supply chains.

Under SSP 2: Moderate investment from national budgets, regional institutions and organisations and international adaptation funds mean that countries have limited human and financial resources to undertake widespread improvements in dengue prevention and control, focusing on urban areas in better resourced countries. Consequently, *Aedes* spp. have increased their geographical range and the length of the transmission season, leading to outbreaks in some years, particularly in outer islands. Early-warning and response systems have been slowly developed: only the island of Viti Levu in Fiji has an operational system. La Niña-associated flooding in 2035 is a particular risk in outer islands when it damages or destroys water and sanitation infrastructure, thus facilitating the spread of dengue fever. Slow investment in information and communication technologies is hampering our understanding of the number of cases of dengue and the damage to infrastructure, and supply-chain problems are limiting the delivery of critical treatments. Consequently, more than 1,200 cases of dengue have been reported by the end of 2035, and more cases are expected to be reported in 2036 as the outbreak continues under the La Niña conditions.

Under SSP 3: Little progress has been made in controlling dengue since the 2019–2020 outbreaks; health systems remain reactive to outbreaks when they occur, with limited effectiveness. With lack of planning and capacity building, information and institutional silos, and little financial support from regional institutions and organisations and international adaptation funds, countries have been unable to modify current or implement new dengue prevention and control measures. Without investments in water and sanitation systems, dengue fever outbreaks continue from year to year, overwhelming healthcare facilities. Under La Niña conditions in 2035, multiple countries have had historically large outbreaks. Damage from flooding limits access to healthcare, and the destruction of water and sanitation infrastructure increases the numbers of cases. Problems in the health supply chain complicate timely and effective treatments. Several thousand cases of dengue occur, overwhelming healthcare facilities.

Broad-ranging impacts on health and wellbeing related to sea-level rise in Pacific island atoll countries

In 2035: Kiribati, Tuvalu, the Marshall Islands and the Maldives are low-lying atoll island countries at high risk of climate and environmental hazards, particularly sea-level rise, cyclones and tsunamis. Those countries have taken the existential threat to their homes very seriously and embarked on a variety of large-scale changes. There was a recognition that due to sea-level rise and resulting flooding, difficult decisions had to be made. Principles were agreed upon in 2019, including the natural inalienable right for atoll people to stay on their islands; resilience as the fundamental focus; recognition of the complex and multidimensional reality; science and knowledge as the first approach; strengthening capacity to adapt; emphasising consultation and consensus building; embracing innovation and traditional knowledge; and recognising the place of security, wellbeing, identity, self-determination, human rights and survival.[12]

Under SSP 2: Despite one Pacific island country relocating its entire population to Australia in 2034, other countries made different decisions. For example, one low-lying atoll built a floating island in line with the wishes of the community to stay on the island. Despite the challenges of obtaining international finance to support that technological response, the country was able to secure a safe, permanent home for 15,000 citizens. However, it's yet to be seen how 'climate proof' the floating island will be. There are good early signs: the most recent flooding event was associated with only a small number of related water-borne diseases, which is very different from projections of a large increase in water-borne diseases due to climate change.

What hadn't been projected in the early 2020s was the increasing toll of climate change on mental health in these islands. Negative mental health impacts such as anxiety, depression and post-traumatic stress disorder rose sharply in the 2020s. That was largely due to uncertainty about the future and the impacts that extreme weather events were having on local communities, particularly on access to health care and education, and general livelihood challenges. The floating island intervention, however, has brought a sharp improvement in population mental health in the island.

Under SSP 3: Slow and inadequate international finance has meant that the floating island remains a goal that's yet to be achieved, putting thousands of citizens at risk of sea-level rise, storm surges and king tides. The burden of diarrhoeal diseases remains high during periods of flooding or drought, affecting the growth and development of affected children. The burden on mental health is high because of the impacts of climate change on health, livelihoods and wellbeing.

Conclusions

The Indo-Pacific in 2035 is now a stark example of how the projected health impacts of climate change have played out across a warming world, with devastating effects in many countries. Experiences among and within countries are diverse, but the extent of the impacts can be seen in every single country, from small island states to industrialised nations. The changing nature of the threats was insufficiently planned for, particularly the sharp rise in cascading and

compounding risks and subsequent impacts. Community resilience has been compromised in ways that were also not foreseen.

In 2035, the impacts of climate change on health in the Indo-Pacific depend not just on the extent of temperature change but also on development choices such as urbanisation plans, interventions to increase access to safe water and improved sanitation, and efforts to reduce inequities. Higher degrees of climate change above pre-industrial baselines in 2035, combined with a world in which there are high challenges to adaptation and mitigation, are projected to result in the largest increases in health risks; lower degrees of climate change, combined with a world aiming for sustainable development, are projected to result in lower increases in health risks. No combination of projected climate change and development choices is expected to result in an overall decrease in the health risks of climate change.

Apart from reducing greenhouse gas emissions, effective and sufficient investments in climate-resilient health systems can reduce the impacts on individuals and infrastructure even as the climate continues to change. A clearer articulation of the health impacts of climate change—and how these impacts are relevant for the diverse collection of countries in the Indo-Pacific—will be key in determining the extent to which appropriate response measures are developed. If the health of populations is continued to be seen as a side issue of climate change, then this region will face many grave consequences. Genuine partnerships and collaborations with countries such as Australia, New Zealand, the US and China will be fundamental to forging a climate-positive future for the region's communities and to safeguarding human health and wellbeing.

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5. Poverty and inequality

Bridi Rice

Introduction

It's the year 2035.

Poverty and inequality rates in low-income countries in the Indo-Pacific are better than in sub-Saharan Africa, but the global temperature increase from climate change has intensified both the frequency and severity of climate hazards. This has compounded pre-existing poverty trends in Indo-Pacific countries, stunted their economies, undermined governance structures and challenged regional development cooperation frameworks.

Fortunately, there hasn't been another pandemic since Covid-19 in 2020–24, which caused significant increases in regional poverty. However, we haven't yet seen a return to pre-pandemic levels of income for many low-income countries in the Indo-Pacific. In some middle- and high-income countries, economic growth has recovered, but inequality ratios have grown.

The key trend in 2035 is the compounding effect that climate shocks are having on economic, health and development indicators, resulting in an increase in poverty. Combined with growing inequality, this is contributing to political instability and, increasingly, conflict. The number of low- and middle-income countries in the Indo-Pacific experiencing this is steadily increasing. In response, bilateral and minilateral cooperation has reached a scale not seen before as countries in the Indo-Pacific join forces to plan for, respond to and mitigate regional stability challenges driven by these trends.

Poverty

Even 20 years ago, in 2015, climate change was already shifting the foundations of economic production,[1] often leaving the poor just one natural disaster away from destitution. Climate change is one of many causes of poverty, acting as a multiplier to erode assets, challenge livelihoods by limiting labour productivity and damaging housing, infrastructure and social networks. Increases in food prices due to climate-related disasters can disproportionately affect rural and urban populations who are living in poverty.[2]

In 2016, World Bank modelling warned that, without significant innovation and investment in climate-informed development, climate change would force more than 100 million people into extreme poverty globally by 2030.[3] However, the Covid-19 pandemic achieved that outcome in only one year,[4] reversing over three decades of progress in reducing poverty and undermining development, particularly in low-income countries. The pandemic impoverished 75 million more people in South Asia alone and revealed national fault lines, particularly for countries with large populations living in poverty.[5] Countries such as Fiji experienced near economic collapse,

in Papua New Guinea the health system strained under the weight of the pandemic and other countries, such as Solomon Islands, experienced political instability spilling over into violence.

Predictions that climate change would affect poor people in rural and urban areas across the spectrum of low- to high-income countries had been made but, even in 2021, those projections were uncertain.[6] Determining where, when and how climate change would affect poverty and inequality rates in the region was difficult, given variations in rainfall and temperature and the regularity of extreme weather events.[7] That was due in part to the complex range of factors that cause poverty, but also because predicting the impact of climate change on poverty relies on differing key variables, such as a country's agroecological zones, coastal geography, climate, economic and social structures, government policies and demographics.

In general, poverty and climate impacts tend to be most pronounced in the world's warmest countries, and major economic impacts of climate change (relative to the overall size of the economy), tend to be concentrated in poorer countries. Those people at high risk are pockets of poor people in low- and middle-income countries with concentrated multidimensional poverty and climate sensitivity; for example, in the Indo Pacific, those in the mega-deltas in Bangladesh, Thailand, Myanmar and Vietnam.[8] Most of the world's richest countries have temperate climates and have fared better in the face of continued global warming.[9]

Looking back from the year 2035, the economic recovery from the Covid pandemic in the Indo-Pacific was by some measures faster than expected. However, the rebound was not equal for all.

Climate change became a threat multiplier for the poor who already interacted with multiple stressors, including social vulnerability, low adaptive capacity, weak institutional support, population increases, natural resource dependence, ethnic conflict, political instability, large-scale land conversions and inequitable trade relations. As predicted by the IPCC, India and Indonesia are on track to have 58 million people at risk from sea-level rise by 2050, demonstrating the sensitivity of low-elevation coastal zones in populous regions; Bangladesh is predicted to have 27 million people at risk.[10]

Declines in poverty occurred in some middle-income countries, particularly in South Asia, East Asia and parts of the Pacific, in the immediate aftermath of the pandemic.[11] In those countries, autonomous adaptation strategies, including migration, livelihood diversification, storage of food and communal pooling of resources, prevented further deterioration, where they were supported by state policy measures. That was the case for Thailand, Malaysia and, interestingly, Samoa, which slipped from upper middle-income status to lower-middle income status as the Covid-19 pandemic hit but—with resilience strategies and stable governance—was able to stave off significant increases in poverty thereafter.[12]

But those success stories are in stark contrast to poverty rates for low-income countries and, in particular, the poorest segments of the population in those countries, who rarely have the resources for such adaptation.[13] Particular examples were countries with higher rates of poverty that were simultaneously experiencing population increase, political instability and

climate disasters, such as Papua New Guinea, where the youth bulge continued to put social and economic pressures on the rule of law.

By 2035, the multifaceted impacts of climate change—compounded by slower economic recoveries after the Covid-19 pandemic—have prevented a return to the pre-pandemic trend of decades of progress in reducing poverty in low-income countries and among the poor in middle-income countries in the Indo-Pacific.

Human insecurity, inequality and health systems

Back in 2014, analysts were forecasting the economic costs of climate change in terms of the country-level or global impact on GDP. That approach illuminated key trends but tended to overlook the impact on human security and especially on countries and populations with high rates of inequality and poverty.[14] By 2021, Pacific island countries were a few years into a loud and public campaign designed to alert the world to the disproportionate impacts climate change would have on small economies and low-lying island nations. The symbolism of then Tuvalu Foreign Minister Simon Kofe giving a speech to the UN COP26 climate summit in Glasgow while standing knee-deep in water where land once was, resonated globally in the following years.

Today, in 2035, the primary ways in which climate change affects those living in poverty—through drought, flood, natural disasters, food scarcity, increased health complications and conflict—haven't changed.[15] What has changed is the growing recognition of the link between people's basic needs (food, water, shelter, energy, safety and respect for human rights) and national security. In this sense, the climate security and regional development agendas of superpowers and middle powers in the Indo-Pacific have merged and are integrated into national security strategies in the region—and into the bilateral partnerships of nations through those strategies. During the mid- to late 2020s, human security became a foundational measure of stability, from the individual to the national and international levels.

Despite the increase in cooperation on climate and development, poverty and inequality continue to disproportionately affect women and marginalised groups across the spectrum of countries in the Indo-Pacific. Because of the complex range of socio-economic, institutional, cultural, political and power relations behind inequality, the impact of climate change on gender inequality is not uniform. However, in general, existing gender inequalities are heightened by extreme weather and climate-related disasters.[16] Besides fear of violence, water and food scarcity are listed as primary concerns of women at the household level in low-income countries, in particular. The increasingly time-consuming task of human survival—the collection of water, shopping, fuel and feeding children in increasingly hostile environments—is leading to more women missing out on educational opportunities and workforce participation.[17] This is a setback to equality for low-income and middle-income countries and a major barrier to economic growth.

Health impacts of climate change are also becoming more visible. Diseases such as malaria and diarrhoea, which disproportionately affect people living in poverty, expanded with climate change, as predicted.[18]

The economic downturn caused by the Covid-19 pandemic renewed the attention of both citizens and states to the issue of insurance as job losses, health coverage and an absence of social safety nets in many states left millions of poor people increasingly vulnerable. Uninsured households suffer a disproportionate loss of income when people become sick or need care, often leading to the intergenerational transmission of poverty.[19] Donors moved swiftly to support governments as they bolstered social safety nets and developed new policy settings in countries such as Indonesia and Fiji, but for some countries the pandemic hit too hard and fast for governments to respond quickly. In addition, an increase in climatic events affecting uninsured populations in countries without strong social protection or insurance markets left those unable to insure themselves with little opportunity to mitigate the increasing climate risks they faced.

Pandemic response versus strengthening health systems

During the Covid-19 pandemic, most nations pivoted their health investments to respond to the acute challenge they faced in managing the transmission of the disease, treating sick patients and rolling out vaccines. In the immediate years afterward, initiatives to strengthen health systems overwhelmingly focused on future pandemic preparedness. In the 2030s, we've seen the delayed impact of those health investment choices in resource-strapped countries; specifically, underinvestment in preventive health measures and routine vaccinations during and following the pandemic have weakened health systems, resulting in setbacks for heart disease and cancer management and the resurgence of diseases previously brought under control, such as tuberculosis.

The pandemic shone a light on the relationship between poverty, inequality and health outcomes that persists in 2035. In the 2020s, it was largely uncontested that poor health and poverty were closely related. However, in the mid-2020s, evidence began to emerge that many health outcomes, ranging from life expectancy to infant mortality and obesity, could be linked to inequality as well, and that those negative health outcomes affected not just the poor but also the affluent. The research indicated that this was mainly because of the link between inequality and social cohesion—a dynamic that creates stress, fear and insecurity in people. In those countries in the Indo-Pacific experiencing increases in poverty and inequality as well as an increase in climatic events, health systems have been particularly vulnerable to being overwhelmed.

Democratic governance and accountability

Looking back, the five-year period from 2015 to 2019 was a turning point for democracy. It was the first five-year period since 1974 when more countries abandoned democracy (12) than transitioned to it (7).[20] When then President Biden came to power in the US, one of his key

early announcements was a renewed emphasis on democracy. In his address to the Munich Security Conference in early 2021, Biden declared that partnerships with the US were rooted in the richness of shared democratic values and built on a vision of a future in which every voice matters. He warned that democracy doesn't happen by accident and positioned the US as needing to defend it, fight for it, strengthen it and renew it if the US was going to compete with its 'challengers'.[21]

Yet, despite that clarion call, nationalism, populism, political polarisation and identity politics conducted through the prism of pervasive digital media were challenging liberalism and institutions in wealthy democracies and causing leaders of many low- and middle-income countries to question whether democracy could deliver. The overlay of geostrategic competition and democratic values turbocharged debate about a potential 'clash of systems' between liberal democracy and autocracy.

But, with the benefit of hindsight, the debate of the early 2020s presented low-income and some middle-income countries in the Indo-Pacific with a false dichotomy. For Indo-Pacific states, the choice of political structure wasn't a matter of values and ideals alone; it was as much a matter of how and to what extent democratic or autocratic norms could influence the ability of any system of government to deliver services to its people.

In 2035, states in the Indo-Pacific are best described as a patchwork quilt of democracy, autocracy and a complex web of national and subnational governance arrangements. The poverty and inequality impacts of climate change alongside the closure of traditional trade routes during unsuitable weather have polarised democratic governance in lower income countries in the Indo-Pacific. In some countries, democratic renewal and a rise in subsistence living are delivering stability if not economic growth; in others, the trifecta of ongoing geopolitical power contests, corruption and a lack of natural resources has resulted in what many describe as states at increasing risk of failure and instability. Climate change and its impacts on poverty, particularly for lower and middle-income countries, brought the ability of governments to deliver human development for their peoples into sharp focus, irrespective of those governments' ideological persuasions.

In 2035, state leaders who are unable to engage and harness their populations while also delivering human development dividends are governing countries challenged by fragmentation. For countries where poverty and inequality trends threaten human security in significant parts of the population—that is, the absence of basic access to healthcare, education, water, sanitation and food security—the population's interests lie less in democratic normative values and more in service delivery. This citizen discontent over growing inequality, entrenched corruption, lack of government services and weak institutions of governance fuels instability and weakens the model of governance in place, whether it's democratic or autocratic.

In Indonesia, for example, where the fragile pact between citizen and state relied for decades on the government delivering human development outcomes for its people through poverty reduction and social protection policies,[22] that balance was upset first by the Covid-19 pandemic and its economic aftermath and subsequently by numerous climate disruptions.

That has led to a collapse of social services across the archipelago and the rapid erosion of trust in the government. The maintenance of unity and stability in Indonesia in 2035 is challenged by increasing poverty and inequality.

In contrast, governments that are prioritising social services, accountability and human security more generally, such as the governments of Samoa and Timor-Leste, are seeing a modest resurgence and renewal of democratic governance—despite their small economies and significant climate impacts. Across the spectrum of democracy, history continues to provide lessons on the challenges of balancing autocratic capacity to maintain stability with democratic principles of individual freedoms and accountable governance. States such as the Philippines, Malaysia and Thailand, which were on a path towards increasingly autocratic models of governance in the 2020s, continue to lurch between periods of stability, repression and citizen uprisings. In the meantime, Western democracies have had to rethink and adjust their democratic principles country by country in order to engage their Indo-Pacific partners effectively.

For countries such as Australia and the US, promoting accountable governance has featured prominently in their regional security and economic development agendas. As incidents of instability mount in the Indo-Pacific, development cooperation continues to respond to state-building and government capability needs. However, the focus has expanded from the emphasis on formal state structures and capability to include significantly increased attention to catalysing citizens' demand for government service delivery. In real terms, this has meant increased donor funding directly to local and national organisations in the Indo-Pacific and the fostering of domestic intellectual ecosystems as a donor priority. This is based on the consensus that effective governance can't be imported from one country to another, but that the enabling environment for effective governance must include engaged populations, active media and vibrant policymaking environments.

How do we minimise the poverty and inequality impacts of 2035?

While we can only speculate about the poverty and inequality trends that the region will face in 2035, we've already witnessed the role Covid-19 has played in increasing poverty and undermining inclusive development, and the role climate change is playing in exacerbating those impacts.[23] In anticipation of the sorts of disruptions outlined in the 2035 scenario, countries in the Indo-Pacific must prepare their domestic and foreign policy settings, budgets and regional cooperation frameworks for a period of significant increase in poverty and inequality and the increasing likelihood of political instability.

As a core element of their foreign policy and bilateral engagement in the Indo-Pacific, countries that provide development and humanitarian aid to the region should systematically integrate climate-change impacts into national and international poverty-reduction efforts.[24] It should be a top priority for those countries to mobilise climate knowledge, tools, relationships and innovation to address the links between climate change, development and human security, and that should be done through enhanced partnerships with Indo-Pacific peers. Strong local

and national leadership as well as international collective action will be needed to address the threats posed by climate change to the prospects for regional prosperity and cooperation between peoples and states in the Indo-Pacific.[25]

At the peak of the Covid-19 pandemic in late 2020, donors, including Australia, France, the US and China, all increased their official development assistance allocations in response to the pandemic and in recognition of the strategic dividends of development engagement. Emerging development cooperation practices—including complementing national development assistance with regional economic integration policies, harmonising trade policies with pro-regional development priorities and building responsive and responsible financing mechanisms—must be expanded.

Climate change will force states to re-examine the relationships between narrow concepts of security, human security, economics, politics and technology. Military concerns are understandably at the forefront of regional superpower and middle-power discourse, but the narrow securitisation of all international engagement—rather than a broader focus on *human* security—risks undermining bilateral influence in countries with high rates of poverty and inequality. Governments, both aid donors and recipients, need to greatly scale up their focus on inclusive economic growth as well as other efforts to mitigate the impacts of climate change on vulnerable communities.

That refocus should include three elements:

- States need integrated national assessments of climate risk and its implications for poverty, inequality and instability.
- Western countries that wish to increase their influence in the region will need to significantly expand their country-specific understanding of human security, sociopolitical and economic challenges.
- Bilateral aid agencies must generate a new narrative for development cooperation that moves beyond tokenistic aid and makes development cooperation a central instrument of international engagement. In many aid donor governments, that will require a root-and-branch rethinking of funding models, strategy, structure and talent.

In the decades ahead, preserving national security will become increasingly difficult without a simultaneous concerted effort to preserve regional human security.

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Part 3
Regional conflict and climate change in 2035

6. Ethnic separatism and religious extremism

Bryony Lau

The IPCC has described in stark language the consequences of the climate emergency that the world is now facing. In Asia, those impacts are likely to include water scarcity, declines in agricultural production, particularly of rice, and dramatic sea-level rise that threatens many major cities and swathes of coastal and deltaic areas. Countries in the Indo-Pacific will need to respond to climate change on top of other long-term challenges, which include ethnic separatism and religious extremism. The next report by the IPCC Working Group II on impacts, adaptation and vulnerability, due in 2022, is likely to paint a similarly grim picture of Asia's future as that contained in its fifth assessment.[1]

Even as the science of climate change becomes clearer due to the efforts of the IPCC and others, the political consequences, especially for ethnic and religious violence, both of which are longstanding challenges across the region, remain murky at best. Despite knowledge gaps, there's a widespread perception among policymakers that climate change will escalate conflict.[2]

More and more political scientists are now attempting to study the issue systematically, but variation in how key concepts have been applied in research—specifically, what to measure when it comes to climate change and what kind of conflict to focus on—has limited the usefulness of findings so far. As a result, efforts to theorise and empirically test the relationship between climate change and conflict have been inconclusive, even contradictory.[3] Research is also uneven across regions, with surprisingly few studies done on the Indo-Pacific.[4]

Political scientists are notoriously bad at predicting the future (the failure to anticipate the end of the Cold War is a long-lasting blemish on the discipline's reputation), so the extent to which evidence-based predictions can be made about the impact of climate change on complex societal issues such as ethnic separatism and religious extremism is necessarily limited.

Nevertheless, scenario planning can be useful in exploring possible outcomes. In this chapter, I follow the example of the 2035 scenario included in this volume and take the information presently available about these conflict dynamics in different parts of the Indo-Pacific to speculate on possible futures for Indonesia, the Philippines and Myanmar. I draw on but don't limit myself to what the scenario anticipates.

What I've attempted to do is to illustrate how extrapolating from present conflict dynamics and capacities to resolve conflicts can help us envision the impacts of climate change on ethnic separatism. The relationship between climate change and religious extremism in the Indo-Pacific is even more difficult to predict; what will matter is whether influential extremist actors perceive the climate emergency as an opportunity conducive to furthering their ideological objectives and increasing their sway among supporters and recruits.

Theorising the relationship between climate change and forms of conflict

Before imagining impacts on ethnic conflict and religious extremism in Indonesia, the Philippines and Myanmar, a quick review of possible pathways that connect climate change to conflict is in order.

On the one hand, scholars have attempted to identify direct effects of climate change as a trigger for conflict due to, for example, changes to rainfall or temperature that are likely to increase competition over scarce resources.[5] One study examined the relationship between climate change, rice production and violent incidents in Indonesia from 1993 to 2003 in 14 provinces. The researchers found that an increase in the minimum temperature reached during the rice-growing season (which decreased rice production) was linked to an increase in violence, although not specifically ethnic separatist or religious extremist violence.[6] In general, however, there's scant evidence from the Indo-Pacific of climate change triggering new violence—and ethnic and religious conflict in particular.

On the other hand, scholars have attempted to assess whether climate change may escalate or diminish pre-existing conflict drivers, often due to their economic impact.[7] Various mechanisms that connect climate-induced economic difficulties to conflict are possible. One is that diminished livelihoods may make recruitment by non-state armed groups, religious extremists, or both, easier by lowering the opportunity costs and therefore making violence more attractive.[8]

Another is that price shocks due to food scarcity could aggravate economic grievances that contribute to armed resistance.[9] As some groups within societies are likely to suffer more economically from the impacts of climate change than others, relative deprivation may increase, which in turn has been theorised to affect armed conflict.[10] The question really is about how much climate change will affect known conflict drivers.

To the extent that there's an emerging consensus among researchers, there have been calls to focus more narrowly on testing the mechanisms that link different impacts of climate change to precise forms of conflict—and to do so at a subnational, even local level. As ever with conflict risk analysis and the trajectories of different conflicts, context matters. Some scholars have even posited that climate change, similarly to natural disasters, may in fact induce cooperation rather than competition.[11] In short, multiple outcomes are possible over the next decade and a half, depending on how governments, communities and diverse influential actors respond. The following sections propose possible futures for the three different countries.

Indonesia

Since independence in the aftermath of World War II, Indonesia has faced multiple ethnic and religious conflicts that at times appeared to have the potential to tear the country apart. Following its transition to democracy in the late 1990s, Indonesia has been able to manage such tensions. They've included the separatist conflict in Aceh, which ended with a peace agreement

in 2005; and religious violence between Muslims and Christians, which reached its apogee in Central Sulawesi and Maluku 15 to 20 years ago.[12] The one remaining active and worsening conflict is in Papua, where efforts to quell separatist sentiment among Papuans through special autonomy have failed.[13]

Violent Islamist extremist networks have deep roots in Indonesia and have often relied on connections abroad for inspiration and support: Afghanistan–Pakistan in the 1980s and 1990s, and the Islamic State in Iraq and Syria in the 2010s.[14] With extensive foreign assistance, Indonesia is now capable of monitoring violent extremist groups through policing. Whether those groups would be able to use the fallout from climate change—from psychological to economic consequences—to increase their support is unclear, although other regions of the world, such as the Lake Chad Basin, show how climate change can interact with drivers of extremism. Among countries in Southeast Asia, Indonesia stands out as comparatively successful at managing ethnic separatism and religious extremist violence.

In 2035, Indonesia's land mass has shrunk due to rising sea levels. The former capital, Jakarta, is now protected by a towering seawall in its far north, although residents continue to rely on aquifers, the use of which causes the city to sink.[15] Most government functions and officials have moved to Kalimantan, the site of a new purpose-built capital. Intensified efforts—especially financial support—have allowed Indonesia to make faster than expected progress in reducing its greenhouse gas emissions, which are due in large part to deforestation.

Muslim mass organisations across Indonesia, notably Muhammadiyah and Nahdlatul Ulama, have supported the government's efforts to shift Indonesia to a low-carbon economy.[16] They continue to partner with local governments at the grassroots and local level to combat deforestation. Meanwhile, extremist Islamist actors have denounced efforts to fight climate change as part of a conspiracy against Muslim-majority countries. A handful of salafi-*jihadist groups continue to launch sporadic attacks—potentially with funding from radical networks outside the country.*

Climate-change induced internal migration has led to escalated conflict in Papua. The arrival of non-Papuan Indonesians in Papua predates the recent climate emergency and has long been a source of resentment and a rationale for Papuans to support the Free Papua Movement.[17] Mass arrivals from Java and other parts of Indonesia continue to further marginalise Papuans. The Indonesian military has intensified its presence in the highland areas where tit-for-tat clashes between Papuan insurgents and the army are a daily occurrence.

The Philippines

The southern Philippines island of Mindanao has for decades incubated an ethnic separatist conflict waged by the Muslim minority, known as Moros, while also hosting religious extremists, both homegrown and foreign.[18] While the Philippines Government has been willing to negotiate with armed insurgents, who eventually whittled down their demands from independence to autonomy within the Philippine state, the peace process has repeatedly failed during the implementation of agreements.[19]

The current iteration of the peace process, which resulted in agreements between the Moro Islamic Liberation Front and the Philippines Government in 2012 and 2014 and the creation of a new autonomous region, called the Bangsamoro, has moved at a glacial pace since the late 1990s.[20] As a result, swathes of the country's south—especially the Sulu archipelago, which borders the Malaysian state of Sabah and Indonesia's North Kalimantan province—are beyond the control of the state. Despite progress in the peace talks, groups that pledged allegiance to the Islamic State have still been able to operate in Mindanao. An illicit economy, including a kidnap-for-ransom industry, and kinship ties that bind non-state armed actors into their communities undermine state authority.[21]

By 2035, sea levels have dramatically increased, transforming coastal areas of the Philippines and straining the capacity of government to respond. In Mindanao, the Sulu archipelago in the Muslim-majority Bangsamoro region has been particularly affected. Not only have smaller islands vanished beneath the rising waters, but changes to ocean ecosystems due to accelerating acidification have devastated the fishing industry. The illicit economy—in particular, the cross-border barter trade with Sabah—is flourishing as the Philippine Coast Guard has inadequate resources to patrol the area.

Quickest to adapt to this new reality in the Sulu archipelago has been the Abu Sayyaf Group (ASG), which span off from the Moro ethno-nationalist insurgency 40 years ago.[22] Its loose structure of sub-leaders, who derive their authority from a mixture of religious authority and relationships with their communities, has proved remarkably resilient. After the ASG's geographical reach contracted in the late 2010s, it was able to reassert itself as local governments in the Sulu archipelago lost authority due to their inaction in the face of climate change. Due to the collapse of income from fishing, communities are more dependent than ever on the spoils from ransom payments distributed by ASG sub-leaders. As fishing vessels from Indonesia and Malaysia stray further away from their regular waters in search of catch, there's no shortage of kidnapping targets.

The disproportionate impacts of rising sea levels on the inhabitants of the Sulu archipelago have strained relations with the Bangsamoro government based in central Mindanao—the other Muslim-majority area of the southern Philippines. Although the two non-contiguous areas both fall under the authority of the Bangsamoro government, history and ethnic differences divide central Mindanao from the Sulu archipelago—differences that are now compounded by the fallout from climate change. After several unsuccessful campaigns by politicians from the archipelago to gain control of the region through elections, they've begun lobbying Manila for a region of their own. So far, the campaign has been peaceful, but political analysts are anxiously watching to see whether Sulu's political elites choose to make common cause with the ASG to ratchet up pressure on the national government.

Myanmar

The coup on 1 February 2021 returned Myanmar to military rule after a decade-long experiment with greater openness and democracy. Under the military's proxy (the Tatmadaw), the Union Solidarity and Development Party, which ran the country from 2010, followed by the

government formed by Aung San Suu Kyi's National League for Democracy in 2015, Myanmar embraced more liberal politics while simultaneously attempting to resolve longstanding ethnic conflict in its upland periphery.[23]

Those efforts were fitful at best, as major non-state armed groups refused to sign the 2015 Nationwide Ceasefire Agreement and conflict escalated in northern Myanmar in both Kachin and Shan states. In Rakhine state, decades of persecution of the stateless Rohingya ethnic minority—sanctioned by many prominent members of the Buddhist clergy—culminated in attacks by a new armed group, the Arakan Rohingya Salvation Army, to which the Tatmadaw responded with 'clearance operations' that drove more than 700,000 Rohingya into Bangladesh in 2017.[24] After the Tatmadaw challenged the National League for Democracy's victory in the 2020 election and seized power, opposition to the military's authoritarian rule has intensified. Over the course of 2021, people's defence forces have emerged across the country, often trained in areas controlled by ethnic armed groups.[25] Myanmar exemplifies the tendency of states that have experienced civil war to relapse into conflict.[26]

In 2035, a decade and a half after the Tatmadaw seized power and pledged to hold elections, Myanmar remains under military rule. Due to the unwillingness of many donors to engage with the authorities, the country hasn't benefited from funding and technology to assist with climate-change mitigation and adaptation. Agriculture, which remains a major part of the economy, has been severely affected due to changes to the annual monsoon. Rice yield has decreased by approximately 10% for every degree of warming. In the coming years, Myanmar farmers may begin cultivating a new variety of rice developed by Chinese scientists that needs less water to thrive.[27] In response to salinisation of soil and freshwater in the formerly fertile Ayeyarwady Delta, the military has forcibly relocated ethnic Bamar—the majority ethnicity—from that area to upland ethnic minority states.

Efforts by the Tatmadaw to exert control over upland areas have foundered despite the military's superior strength. It appears that forced relocation of ethnic Bamar—modelled on Indonesia's transmigrasi *program, which moved landless people from Java to less populated areas—has backfired. The relocations have allowed ethnic Bamar and other minorities to forge a shared political vision for the future that's radically anti-capitalist and anarchist and supported by prominent Buddhist monks and Christian clergy.[28] The tempo of attacks by ethnic armed groups and people's defence forces has also increased.*

Sea-level rise and climate change-induced migration in Bangladesh have made the massive Rohingya refugee camps across the border even more unhabitable than they were before. A deal brokered by China saw large-scale returns of Rohingya to highly securitised camps in northern Rakhine State over the past three years. Individuals suspected to have ties to the Arakan Rohingya Salvation Army have been jailed. The military authorities continue to refuse to grant citizenship rights to the Rohingya.

Insights and conclusions

Climate change will have devastating effects in the Indo-Pacific, but the scale of those impacts can be reduced by meeting commitments to minimise global warming and by governments taking proactive steps to protect the most vulnerable. Many societies in Asia are already profoundly unequal and struggling to manage and resolve longstanding conflicts. A holistic policy response to climate change in the Indo-Pacific needs to consider the possible fallout in the form of conflict, especially ethnic separatism and religious extremism. Countries in the Indo-Pacific that have managed to resolve ethnic separatist conflicts at the peace table will be better positioned to respond to the effects of climate change. Successful political settlements build trust; repeated failures can make it hard to resume dialogue. For countries, such as Myanmar, that have been unable to escape decades-long patterns of conflict and are also poor, the potential impacts of climate change could be devastating. Where negotiated peace is fragile, as is the case with the Bangsamoro in the southern Philippines, policymakers and politicians will need to be mindful that climate change may deepen old fault lines. Little is known about the possible response of religious extremists to climate change, but they have a history of opportunism and of being more agile than the governments and systems they oppose.

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7. Transnational crime

John Coyne

Transnational crime is innovative, amorphous and entrepreneurial. Those characteristics will see it thrive in a climate-changed world in the years leading up to 2035. It will continue to range from drug cartels to apparently legitimate supply chains and financial institutions, and to corrupt politicians and officials.

Current regulatory and enforcement responses to transnational crime across the region focus on the seizure of illegal and grey-market commodities, as well as the arrest and prosecution of offenders.[1] That approach has embroiled the region's governments in a perpetual war of attrition—and it just isn't working.[2] There's little to suggest that change is on the horizon. The consumption of illegal and grey-market products is increasing, and the cost of transnational crime to regional governments is rising.[3]

Climate change makes all this worse—or better, if you're in the business of transnational crime. It will have a broad array of economic, social, environmental and strategic impacts on the Indo-Pacific.[4] Without the concerted intervention of governments, transnational crime will be one of the few winners from climate change. As the intensity of climate-change effects increase, many economies are likely to falter, and states' capacities will be strained. Once vacated—or even just weakened—by legitimate actors, those are spaces into which transnational crime can expand. A more integrated approach to denying transnational criminal groups such opportunities is needed.

State failures and spillovers

Transnational crime groups operate across and within every nation-state, yet they require specific conditions to thrive. Inequality and vulnerability provide catalysts for the groups. Ill-conceived regulation and legislation help create illicit markets and profits. Climate change simply adds stimuli for all those conditions in the coming decades.

Climate-change-affected, less developed countries in the Indo-Pacific will become increasingly vulnerable to exploitation by transnational crime groups. Corruption risk in less developed states is likely to increase dramatically as the economic impacts of a global trend in reduced demand for unskilled and semi-skilled labour accelerate (where legitimate income is harder to obtain, transnational crime will have willing partners).[5] The increased intensity and frequency of extreme weather events will exacerbate that trend. It's likely that transnational crime groups will seek to leverage the permissive environments created by economic downturns, civil unrest and strained bureaucracies. As seen today with heroin and cocaine supply chains, those countries most affected by those trends will become the loci of high-risk and visible elements of transnational crime businesses, including the production of illegal and grey-market commodities, which can then be moved into other economies and societies.

But, while vulnerabilities within states are key variables, transnational criminal activity does not and will not respect sovereign borders. It exploits the gaps and seams between many types of boundaries, including those between states' border policies and operations. Spillovers are the rule, not the exception, as has been observed since the globalisation of serious and organised crime gained pace in the 2000s. Globalisation in the context of transnational crime doesn't mean homogenisation or monolithic centralisation. Instead, globalisation allows cooperation and coordination across geographical, economic and technological domains in response to opportunities. Even the most hierarchical, ethnically or geographically defined transnational crime entities seek to integrate, with little consideration of traditional sovereign borders. For example, a given group—such as an outlaw motorcycle gang or a Chinese triad—won't have end-to-end control of a supply chain or a monopoly on a given commodity.

Amorphous groupings that collaborate for specific business opportunities will still operate in the Indo-Pacific's climate-changed region, but the relationships between those parties are likely to be increasingly vertically integrated because of the complexity of activities such as money laundering. The amorphous integrated supply chains will eventually make market entry for new criminal actors difficult, while making existing groups more resilient to traditional law-enforcement disruption. Many of those involved will have learned their lessons from Covid-19 and understand the need for resilience in supply chains. Climate change will increase demand for illegal services and maintain demand for products such illicit drugs. However, the more notable demand increases, related to the 2035 scenario in this publication, will come in the 'grey' markets—counterfeit or diverted pharmaceuticals and food protein—and demand for those commodities is likely to rise at the same time as their licit supply is strained. That development will see a further blurring of the lines between the legal and illicit economies, and some actors will actively and simultaneously leverage both economies for profit: this is already being seen in the pharmaceutical and tobacco industries.

Criminal governance

These opportunities are also likely to see transnational criminal actors increasingly provide state-like governance functions. That might be in the form of cross-border facilitation as well as the direct provision of employment or services, as we've seen in several Southern and Central American states during the Covid-19 crisis.

In the face of resource pressures in less developed Indo-Pacific states, the regulatory environment in those states will become more porous, especially in contrast with the more developed states. Such weakened and poorly enforced regulatory environments will be created by bribery and corruption risks borne from or obfuscated by complex legislative frameworks and opaque governance arrangements. That trend will give rise to a new generation of criminal facilitators. Facilitators already provide transnational crime groups with bridges between less developed and developed states. They also offer technology-enabled services such as secure communications and product concealment for cross-border movements of goods and people. In other cases, they provide production and smuggling services or even access to goods and services for the consumer (for example, access to trafficked labour).

Some transnational criminal actors will also enjoy a significant degree of legitimacy. While in wealthy states criminal actors, regardless of pop-culture romanticisation, are negatively perceived, that isn't the case in many developing settings. For example, people smugglers in many states are considered heroes and saviours by those seeking to move for safety and economic opportunity.[6] Extensive research has also documented the well-accepted role played by even very violent criminal groups in maintaining social order and providing services in marginalised communities, either in lieu of the formal state or in collusion with it.[7]

Climate change will create conditions in which local communities regard more criminal groups as saviours and heroes. Some criminal groups will likely seek to meet unrealised demand for affordable access to such commodities as food, medicines and water. For example, there's already a growing global market for the supply of cheap antimalarial medication, which in many cases is either counterfeit or diverted from legitimate supply chains.[8] Unlike those selling illegal products (such as illicit drugs), these criminals are welcomed by communities under stress, especially when they undercut market prices for products. In some Pacific and Southeast Asian states, criminal groups may eventually present themselves as alternatives to legitimate governments. This isn't so different from groups that are formally designated terrorist groups—such as Lebanon's Hezbollah—being primary service deliverers in local communities. Their status as heroes and saviours protects them from detection and disruption, making their networks far more resilient.

Illegal products and services

Yet, despite the likely expansion of criminal actors into hitherto formal sectors, plainly illegal commodities such as drugs will remain an important dimension of transnational crime. Two distinct features will characterise the region's future as a consumer market for illegal products and services.

In the first instance, much of the region is a high-volume and low-profit market for both plant-based and synthetic drugs. Transnational crime groups prefer synthetic drug production for markets in less developed countries because production can be scaled up quickly and at low cost to meet demand. Markets in more developed nations, however, including Australia, Japan and New Zealand, are comparatively lower volume but extremely high profit. In those places, consumer demand will probably continue to drive the market. Between those two extremes will be the smaller states in the Pacific that won't be attractive to globalised groups because they're both low volume and low profit.

One of the growing markets for illegal services will be money laundering. Increased technical sophistication and more funding for anti-money-laundering work will make this activity more complex. Those barriers will increase the reliance of transnational crime groups on leveraging more capable criminal actors operating in relatively permissive jurisdictions. That could well be a vulnerability that can be exploited by law enforcement and policymakers. While climate change won't directly drive trends in either drug markets or demand for money laundering,

the pressure it will place on the capacities of developing states will provide cross-border opportunities that will shape transnational criminal activity in those areas.

A further area of growth will be human trafficking and people smuggling. An increasing number of displaced people across the Indo-Pacific, combined with stricter border controls in destination countries, will make people smuggling a much more complex activity marked by increased criminal sophistication. Under the 2035 scenario that's the foundation for this chapter, increased food insecurity and compounding natural disasters that stretch or break local state capacity are likely to drive increased people movement. So, those stricter border policies will occur at a time when more people will be seeking to move irregularly across the region in search of safety and economic security. Rising costs for people smuggling result in increased crime rates in embarkation and transit countries. They'll leave a growing cohort of travellers open to exploitation and willing to undertake high-risk ventures.

Grey-market products and services

The most significant changes to transnational crime in the Indo-Pacific region driven by climate change will be the provision of grey-market products and the deepening of the linkages between formal and informal parts of the regional economy.

Market and policy responses to climate change are making supply-chain certification increasingly prevalent. While the certification systems will have vulnerabilities, consumers will be able to track the origins of foods, medicines and other products from the retail level to their sources. However, certification brings with it additional costs and, while wealthy consumers are willing to pay a premium for fully certified products, many in less developed states will be unable to do so. Counterfeiting of certification is likely to rise as the premiums paid for certified products increase.[9]

That will create market opportunities like those observed in the grey market in tobacco over the past two decades.[10] Transnational crime groups will seek to exploit such developments using two different models.

The first model will see the contamination of legitimate supply chains with 'fake products' that are either not made to the required standards or carry falsified certification.

The second method will involve smuggling grey-market goods—to avoid tariffs and taxation—to markets in less developed and developed states. As in the illicit tobacco markets, criminal groups will provide consumers with access to cheaper products than those available in the regular economy. Transnational crime groups have already used both methods with liquid fuels, timber, wildlife products, foods and medicines.[11]

Many consumers in less developed states will welcome these developments, but they'll have broader negative impacts, such as providing substandard medicines and building products as well as giving financial support to other criminal activities and undermining the revenue of already vulnerable states.

Climate change's broader impacts make the connections and interplay between the legitimate, grey and illegal economies more profound. Criminal organisations that once manipulated the vulnerabilities created between jurisdictions in the early 2000s will progressively use ever-more complex regulatory frameworks to obfuscate their activities. In general, this will mean that the operations of criminal groups will become more difficult to detect.

Technology remains critical to both enabling and fighting transnational crime across the Indo-Pacific. Activities such as the diversion of precursor chemicals for illegal synthetic drug production will be enabled by a combination of technology and corruption. But, while those criminal activities can be enabled by technology, countering them can be assisted by the adoption of data collection and analytics that identify anomalous trades and volumes. Without wider changes in states' policies and capabilities, governments' capacity to analyse big data will be well behind that of criminal actors willing and able to acquire and deploy new capabilities, especially in less developed states.

Even as regulators and law enforcement increasingly rely on artificial intelligence and self-learning algorithms to make sense of big data and detect anomalous activity, that will produce new seams for transnational crime to exploit. Criminal groups will attempt to adapt, and they'll eventually be capable of developing means to defeat, deceive and disrupt artificial intelligence. The most elegant technological applications and methodologies will almost certainly remain vulnerable to the corruption of trusted individuals who work within systems and organisations to identify and exploit vulnerabilities. Once again, the opportunities for doing so will be most available in the climate-change-stressed developing states within the region, where economic opportunities will be diminished and regulatory capacity strained.

In an example of the vicious cycles typical of transnational crime, the closer links between legal, grey and black markets will increase criminal groups' capacity to engage communities. There's already evidence to suggest that, during the early stages of the Covid-19 pandemic, criminal groups in Central and South America provided services unable to be delivered by legitimate governments.[12] As the impacts of climate change intensify, some of the most prolific criminal groups will offer communities in the Indo-Pacific access to goods and services at low prices not able to be delivered by governments. That development will create further weaknesses in the rule of law and the capacity of governments to provide considered policy outcomes.

Broken models

Traditional law-enforcement strategy focuses on increasing seizures to reduce criminal profits. However, the dispersed nature of the criminal threat and the closer relationship between legal, grey and black markets will ensure lower costs to produce illegal and grey products. The arrest of offenders in order to disrupt groups will thus have decreasing impacts on transnational crime as climate change intensifies. Law-enforcement organisations will accordingly need to reconsider their strategies.

Governments' traditional approach to responding to transnational crime with legislation, increased spending on law enforcement, or both, will decline in effectiveness. In the years to 2035, successful law enforcement will increasingly rely on intelligence supporting carefully targeted strategic interventions. In parallel, the development of police capacity across the Indo-Pacific will need to broaden concepts of effective policing and focus on enhancing human security, thereby denying criminals the opportunity to act with impunity.

Efforts to continue the professionalisation of law enforcement across the region are central here. However, the focus shouldn't be on securitising police or doubling down on traditional law enforcement, but instead on enhancing community safety and cohesion. This approach prioritises problem solving, rather than arrests and seizures. In other words, reducing the structural opportunities for criminal actors to exercise 'legitimate' functions and meet certain community demands must accompany targeted enforcement operations.

Preventing transnational crime groups from becoming an alternative to government in providing public goods will be essential to disrupting their growth. Governments can only do that through policy measures that promote economic activity and a public service trusted to deliver services and then building delivery capacity so that it will work in the climate-disrupted environment of the 2030s. The continued reform and professionalisation of public sectors across the region will be important.

As criminal and illegal activity lines become further blurred, transnational crime will become a factor in almost all government policymaking and private-sector investment. A proactive approach is already needed to counter the deepening linkages between the licit and illicit sectors. Environmental impact studies are now integral to policy decision-making processes in both the public and private sectors and may provide a model. A new crime vulnerability assessment methodology must be developed and integrated into all major policy and investment decisions, disrupting the opportunity for transnational criminal groups to profit from vulnerabilities.

Conclusion

As we look to 2035, climate change will progressively exacerbate state weaknesses and failures and their associated spillover effects in already vulnerable developing states in the Indo-Pacific. That trend will provide expanded traditional opportunities for transnational criminal actors as governments and markets fail to provide various goods and services. But it will also reshape transnational crime in certain ways: various 'grey' commodities will provide a new sector for criminal expansion, the linkages between legitimate and illegal sectors will deepen, and cross-border activities will provide opportunities for capable criminal actors to operate from relatively safe havens into wealthier states. In that setting, it's likely that the perception of comparative criminal 'legitimacy' in many vulnerable communities in the region will intensify.

Governments must adapt accordingly. At the very least, they should mitigate the impacts of climate change to prevent the outlook worsening. But they should also make a concerted effort to safeguard and strengthen state capacity and redesign delivery systems to operate in the world that the 2035 scenario describes. Here, regional cooperation will be needed, with a focus on the already vulnerable states in the region. That cooperation should have a twofold focus: first, effective social and economic responses are needed to prevent opportunities for criminal groups emerging; second, an integrated understanding of the place of transnational crime in the broader economy and regulatory environment must replace traditional but ineffective enforcement methods.

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8. Population displacement and migration

Tobias Ide

Introduction

The potential impact of climate change on population displacement—and on migration patterns more generally—has attracted considerable attention from policymakers and scholars. Here, I draw on that body of research to illustrate some implications of the 2035 climate change scenario for the Indo-Pacific region. It's unlikely that fundamental patterns of human migration in response to environmental stress and socio-economic conditions will change in the next two decades, even under abrupt climatic changes as outlined in the scenario.

Migration is generally driven by push factors (motivating people to leave a place), pull factors (attracting people to a certain place) and network factors (enabling movement from the sending to the receiving region). Climate change will mostly affect push factors, for instance by making islands and low-lying areas uninhabitable or by destroying agricultural livelihoods.

Previous work indicates that climate change is a driver of human migration. For example, a recent meta-analysis by Roman Hoffmann and colleagues shows 90% agreement among existing studies that environmental change leads to increased migration.[1] In the case of short-term, predictable climate-related disasters such as annual floods, people usually move short distances to get out of harm's way and return once it's safe to do so. However, if climate-related disasters persist for long periods (such as droughts), occur with high frequency or exceed the scale to which societies have adapted over time (so-called '1-in-100-year' or '1-in-1,000-year' events), massive livelihood loss can induce long-term and long-distance migration.[2]

There's still debate about how much such migration is international. Anouch Missirian and Wolfram Schlenker found that higher temperatures result in more asylum applications in wealthier countries,[3] but most current research indicates that, due to language, cultural and financial barriers, climate-change-related migration will most likely be to urban areas within the affected countries or to neighbouring countries.[4]

When it comes to network factors, climate change will also inhibit migration. Large-scale disasters—such as the 2032 global food security crisis in the 2035 scenario, massive storms or prolonged droughts—deprive households of savings and assets. Without those resources, people lack the means to pay for their relocation. Likewise, they might not have the seed money needed to establish a livelihood in their target area. Consequently, they're unable to migrate. People in such situations are called 'trapped populations'. Climate change will aggravate this phenomenon, thereby also undermining local adaptation efforts such as moving to safer locations. Households that are already poor and vulnerable are most likely to end up trapped.[5]

Based on those insights, I now discuss the potential impacts of the 2035 climate-change scenario on population displacements in two parts of the Indo-Pacific region: East Africa and South and Southeast Asia.

East Africa

On the western edge of the Indian Ocean, countries along Africa's east coast are very vulnerable to climate change. Poverty rates in Ethiopia, Kenya and Somalia are high, while government support is limited and not available in all parts of the country. In an already relatively dry region, climate change is predicted to increase the frequency and intensity of droughts, interrupted by downpours that wash away fertile soil and cause floods. Climatic changes can have dire consequences, as most of the people depend on rain-fed agriculture for their livelihoods. Rapid population growth and recurring political instability (such as state failure in Somalia and the recent Tigray war in Ethiopia) further aggravate the situation.[6]

Climate change as described in the 2035 scenario will have complex impacts on local migration dynamics. Three patterns are particularly relevant.

First, in the arid and semi-arid areas of East Africa, pastoralists move their herds of cattle in accordance with seasonal weather patterns to find sufficient water and fodder. Their livelihoods are well adapted to an environment with limited rainfall and long dry seasons. However, as rainfall is becoming less predictable and droughts are getting longer and more intense, pastoralists are struggling to find sufficient resources within their traditional territories. The increasing exclusion of local populations from land used for conservation or development schemes further limits pastoralists' access to resources. These groups are highly mobile and unlikely to become trapped populations, as they're already migrating longer distances in search of water and fodder. That pattern will be amplified as climate change becomes more intense. Increased movement can strain the labour resources of pastoralists. Furthermore, pastoralists might move their herds into areas where they compete with other pastoralists for resources, or where their cattle damage the crops of farmers. This has resulted in community tensions in the past; in the 2035 climate scenario, it could result in significant intercommunity violence.[7]

Second, in the 2035 scenario, climate change will have massive negative impacts on the agricultural yields, and hence livelihoods and food security, of farmers and farm workers in Ethiopia, Kenya and Somalia. Currently, less than 3% of all agricultural land is irrigated and access to insurance or alternative forms of income is limited, so the agricultural sector is highly vulnerable to droughts. As a result of income, employment and asset losses, farmers and farm workers face considerable risk of becoming trapped populations. Their livelihoods are severely undermined by climate change-impacts, but they lack the means to migrate out of at-risk areas or otherwise adapt. For example, a recent study in Ethiopia found that only households with sufficient income can migrate as a means of income diversification under environmental stress.[8]

Third, if climate-change impacts act as push factors and households have the necessary resources to relocate, migration flows are most likely to be from rural to urban areas due to the long-lasting impacts of droughts. On the one hand, this offers opportunities if households

move out of the worst affected areas, if migrants have better access to education and health services in cities, or if individuals can send remittances to rural areas. On the other hand, migrants can end up in slums on the outskirts of cities such as Jijiga, Mogadishu or Mombasa, with little access to income or social services. Such slums are also often located on steep slopes or in flood-prone areas and are therefore particularly exposed to climate-related hazards.[9]

South and Southeast Asia

Bangladesh is home to 180 million people and is one of the countries most exposed to climate change. It's in the Ganges–Brahmaputra delta and is subject to monsoon cycles and cyclones, and large parts of its land area are only a few metres above sea level. That makes it prone to storms, floods and droughts, all of which will increase in frequency and intensity under the 2035 climate-change scenario. A large proportion of its people are very poor and depend on agriculture for their livelihoods as crop farmers or agricultural labourers. The agricultural sector is particularly vulnerable to changes in climatic conditions, particularly in the absence of buffer measures such as insurance schemes. Currently, around 400,000 people migrate each year from rural areas to the capital city, Dhaka.[10]

Will climate-related disasters further amplify that trend until 2035?

The answer isn't straightforward and depends on how push and network factors are affected by climate change. Given the adverse impacts of climate change on people's livelihoods, the number of people leaving their devastated homes in search of a better life in urban areas will most definitely increase (even though the receiving urban areas, such as low-lying and coastal cities in Bangladesh, are also often highly vulnerable to climate change). Asif Ishtiaque and Nurul Islam Nazem estimate that around 18.5% of migrants arriving in Dhaka are subject to disaster-induced income shocks.[11] However, hazards such as droughts or floods also interact with pre-existing vulnerabilities such as migrants' lack of land ownership, bank savings and strong social networks. While Clark Gray and Valerie Mueller agree that climate-related disasters have a moderate effect on migration within Bangladesh, they argue that that's the case only for medium-scale disasters.[12] Households can adapt to and cope with small-scale disasters, but losses in large-scale disasters are so grave that migration becomes financially infeasible.

This indicates that, under the 2035 climate change scenario, two migration-related issues will be acute in Bangladesh. On one side, more intense and frequent climate-related disasters will deprive a large number of households of the possibility of migrating. Those people will usually be extremely poor and inhabit disaster-prone areas, which have grave implications for their ability to adapt to climate change and ultimately for their human security. On the other side, migration to urban areas will increase. With reduced international cooperation, adverse climate impacts on economic growth and global food crises under the 2035 scenario, migrants are unlikely to find decent employment or living conditions in the growing cities. Some scholars have voiced concerns that recently arrived migrants in Dhaka's slum areas are more likely to be recruited by criminal networks and religious extremists.[13] If those concerns prove justified, the 2033 Summer of Terror could have organisational links to—and take place in—Dhaka as well.

Vietnam, like Bangladesh, is highly vulnerable to climate change. The country has more than 3,000 kilometres of coastline and is therefore highly exposed to sea-level rise and tropical storms in the South China Sea. The large and densely populated deltas of the Red River and Mekong River are already highly prone to flooding. Under the 2035 scenario, millions of additional people will be exposed to severe floods. At the same time, soil salinisation due to sea-level rise, floods and storms will devastate rice fields and export agriculture, which is a major source of income in most parts of Vietnam. Coastal fish stocks and fisheries already suffer from growing ocean acidification today. With the strong climatic changes in the 2035 scenario, droughts in inland provinces will become more severe and more frequent. Climate change thus has serious implications for the human security of Vietnam's 97 million citizens.[14]

Research suggests that sudden-onset disasters such as typhoons and floods are currently significant push factors for within-country migration in Vietnam. Rapid climate change is likely to amplify that trend. Slow-onset disasters, by contrast, currently have no significant effect on migration. This suggests that, in a middle-income country[15] with considerable irrigation infrastructure, people can adapt to droughts and soil salination. However, more dramatic climate changes from now until 2035, combined with economic repercussions and a lack of international support, might well undermine Vietnam's adaptive capacity. That could increase migration flows and livelihood insecurity, with potentially adverse impacts on political stability. According to Vally Koubi and colleagues, Vietnamese migrants hit by slow-onset disasters in their former homes are more likely to experience political conflicts in the areas that receive them.[16]

Those currently migrating in response to climate-related disasters in Vietnam are mostly highly educated or skilled individuals. Agricultural workers, by contrast, are most vulnerable, yet less likely to migrate after such disasters. This indicates the existence of significant trapped populations, which are very likely to grow under the 2035 climate-change scenario.[17]

Conclusion

Based on this discussion of five countries in East Africa and South and Southeast Asia, and in line with studies on other parts of the Indo-Pacific region,[18] I draw four key conclusions:

- Rapid climate change (as envisioned in the 2035 scenario) will displace populations and affect migration patterns in the Indo-Pacific.
- Climate change is never the only driver of migration but intersects with other push factors (such as violent conflict), pull factors (booming economies) and network factors (accessible transit routes)—all of which can also be affected by climate change.[19]
- Climate change will mostly affect migration within (or to neighbouring) countries, rather than long-distance international migration. Such migration might increase risks of local political instability.[20]
- The impacts of climate change on migration are very hard to quantify, but the number of migrants is likely to be lower than commonly expected.[21] This is due in part to local adaptive capacities, but even because households impoverished by climate-related disasters

lack the means to migrate to safer or more prosperous areas. Such trapped populations are more likely to suffer from low human security and less likely to adapt successfully to climate change.

At the beginning of the 2020s, what can be done to prepare for a high-impact climate-change scenario (no matter whether it occurs in 2035, 2050 or 2065)? The obvious answer is to drastically reduce greenhouse gas emissions. One might doubt whether such a reduction is possible but, even if it were, some climate change is already 'locked in' due to past emissions. That makes early, well-funded and inclusive adaptation measures highly important. Those measures could include access to agricultural insurance throughout the Indo-Pacific, mobility corridors for East African pastoralists, agricultural development schemes in Bangladesh and flood protection systems in Vietnam, among other things. Those measures must be developed in close consultation with local groups and must avoid discrimination based on caste, ethnicity, gender or income. Such measures can not only strengthen livelihoods and reduce involuntary migration but also support migration as a form of adaptation.

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9. Climate change and military forces

Michael Thomas

Introduction

Climate change will have significant security implications for Indo-Pacific military forces in 2035, which is a suitable year to assess the risks. Too often, climate scenarios set in the more distant future (such as 2050 or later) fail to gain traction or to resonate with policymakers and citizens who are preoccupied with more immediate challenges. In contrast, 2035 is squarely in view, especially for military planners, for whom planning to identify security threats and develop credible response options (for example, capability, infrastructure and shaping of the strategic environment) is core business.

2035 is significant in other ways. It will mark the 50th anniversary of the Villach Conference, from which climate change was lifted from dusty scientific chalkboards to political prominence as an emerging global threat.[1] It's a bridging year that connects the missteps and triumphs of the recent past with the possibilities of a reimagined future.

Extrapolating from the present, using this volume's 2035 climate scenario as the reference point, climate change is likely to affect core elements of military power at three levels:

- At the *strategic* level, climate change challenges the very conception of 'national security', justifying a reassessment and rebalancing of national effort and the development of regional cooperation measures.
- At the *operational* level, climate change will have significant impacts on military deployments that portend changes to military structures and equipment to address those impacts. Wider policy responses to mitigate climate change will also sharpen the focus on the carbon footprint of military organisations and create pressure to build 'net-zero militaries'.
- At the *tactical* level, climate change will affect facilities, bases and infrastructure, as well as the 'software' of military doctrine and training.

In this chapter, I discuss the three levels of impacts and canvass suggestions for militaries to help them prepare for and better manage the disruptions likely by 2035.

Strategic implications

In the 2035 climate-change scenario, the world is transformed but still recognisable. It's a dystopian future of increased climate hazards, sea-level rise that triggers population displacements, water and food stress and fracturing social conditions, but there will also be strategic opportunities. Those opportunities potentially include greater international cooperation on emissions reduction and green technological innovation driving the acceleration of a new global energy economy.

In this context, three strategic implications with military consequences stand out. The first is that climate change fundamentally challenges the very meaning of 'security'. Nations have traditionally invested in their militaries to deliver 'hard' security. It isn't the only tool available to governments—and it's often narrow and blunt—but historically it has contributed significantly to deterrence and has been a form of insurance when deterrence fails. While that will continue to be the case in the years to 2035, it's increasingly clear that the threats posed by climate change (sea-level rise, drought, extreme weather and so on) can't be adequately addressed solely by a military solution.

In this environment, and depending on the extent to which militaries are resourced for wider tasks, support for armed forces to receive the lion's share of resources earmarked for national security may erode. While that's likely to have implications for how nations rebalance their national security portfolios, it could equally be an opportunity to reassess how Indo-Pacific militaries can come together to meet a common challenge, particularly in the area of climate-related disaster relief. Whereas climate change as a driver of conflict remains a somewhat 'diverse and contested' area[2] (and therefore making it difficult to assess future demands on militaries), climate change is almost certain to drive an increase in natural disasters.[3] Cooperation between militaries could take the form of increased dialogue, military exercises and exchanges with a focus on disaster relief; shared training and climate security intelligence; the development of regional (environmental) security strategies; and joint funding of capability and military basing. The establishment of a permanently staffed multinational Indo-Pacific humanitarian and disaster relief response force with a rotating national command would enhance regional cooperation and provide operational purpose for Indo-Pacific security forums as well as improved interoperability between militaries and a swift regional response capability for natural disasters. Rather than designing national militaries based overwhelmingly on the demands of deterrence and war fighting, a climate-changed world could offer common purpose to develop more integrated regional militaries working together to meet contemporary challenges.

Built into the fabric of a regional disaster response force could be an early-warning Indo-Pacific climate intelligence centre, which would draw on climate data and analysis from participating national meteorological, academic and scientific institutions to create a common Indo-Pacific climate operating picture. By bringing together scientists and militaries, the intelligence centre could develop regional climate crisis scenarios, geospatial climate–intelligence products, climate security research and educational tools, as well hosting climate 'war gaming'. Regional climate intelligence centres would strengthen the UN's emerging Climate Risk and Early Warning Systems (CREWS)[4] and inform the IPCC's assessment reports. By providing actionable climate intelligence, the centres could inform farmers and fishers as often as soldiers and sailors.

The second area of strategic significance is the transformation of the global energy system. Driven by the urgent need to tackle climate change, the shift to the new energy economy by 2035 is likely to bring tectonic geopolitical change with profound implications for military force design and capability. Coal, oil and gas—the pillars of 20th-century energy infrastructure—will

be overtaken by decentralised, scalable and locally produced renewables: hydropower, solar power, wind power, large-scale battery storage and nuclear energy (as a niche provider).[5]

The rise of the new energy economy will also—for the first time since the pre-industrial era—make many nations energy self-sufficient, and it's possible that currently energy-impoverished nations will leapfrog from dependence on fossil fuels to renewables. Going to war over energy resources may become increasingly anachronistic in the decades ahead. Conversely, there are likely to be major shifts in the nature and distribution of critical supply chains. Most obviously, control of the inputs into critical renewables manufacturing as well as access to the industrial bases of such technologies may become a geopolitical imperative. We should expect that states across the Indo-Pacific will use various levers of national power, perhaps including military power, to ensure such control and access.

The third area of strategic consequence relates to changes in the physical environment that create regional climate crisis hotspots with military consequences. In the Himalaya, glacial melt is accelerating, significantly altering the downstream flow of water to 1.3 billion people who depend on seasonal run-off for irrigation, hydropower and drinking water.[6] Across the northern Indo-Pacific, climate change has the potential to stimulate great-power competition for access to Arctic resources. On the southern flank, Antarctica is likely to be another geostrategic hotspot, especially as the Madrid Protocol governing mineral resources on the frozen continent may come under review in 2048.[7] The possibility of existing Antarctic bases undertaking covert mineral prospecting and the gradual emergence of mining and fishing for 'scientific purposes', supported by military personnel, bases, naval ports and military-grade airstrips, is a feasible development—one need only look at China's South China Sea playbook since 2012.[8] Incremental militarisation of the region's southern arc—accelerated by the prospect of a warming climate by 2035—would create considerable angst for Indo-Pacific countries that consider the Antarctic to be in their spheres of influence. Pressure on Australia and New Zealand, which together claim more than 42% of Antarctic territory, to develop military polar-projection capabilities will mount.

By 2035, regional migration due to sea-level rise, inundation, extreme weather and altered patterns of precipitation is very likely be another strategic factor for the region's militaries. While much depends on the rate of warming and local adaptation efforts, militaries will invariably be drawn into the provision of security, border protection and disaster relief. Effective responses to climate-change-driven migration will be served best by collaborative regional solutions rather than unilateral action.

To position themselves for 2035, militaries must increasingly factor such climate-hotspot scenarios—and their myriad variations—into their strategic planning and war gaming. Military planners should use the benefits afforded by strategic climate foresight to strengthen military-to-military diplomacy and help steer national policymakers towards cooperative regional solutions.

Operational implications

By 2035, climate change will drive a broad range of more frequent and extreme climate hazards. The Indo-Pacific will be particularly vulnerable, as it's already one of the most disaster-prone regions on the planet.[9]

Militaries, which are frequently called upon as first responders in natural disasters, will be compelled to mount more disaster relief missions both domestically and internationally. Climate change has the potential to stretch military capacity, especially if multiple concurrent disasters occur across the Indo-Pacific. It's possible that extended fire seasons will bring large-scale rolling wildfires from August to May across southern Australia at the same time as multiple cyclones wreak havoc across the South Pacific, the Indonesian archipelago and the Bay of Bengal. The increased scale and intensity of natural disasters will be compounded by increases in their frequency. Events that were once regarded as occurring only once every hundred years could occur annually by 2035, undermining the resilience of regional militaries and limiting their recuperation and regeneration.

To prepare for this altered world, militaries must review their force structures; they'll need to find a balance between developing high-end war-fighting capabilities and meeting growing demand for disaster-relief capabilities. This should be viewed neither as an opportunity to build larger militaries nor as a mandate to burden them with ever more responsibilities. In the decade through to 2030, the opportunity for regional militaries to share responsibility for increased disaster relief missions while retaining their war-fighting capabilities could prove an effective approach that balances cooperation with competition.

But this challenge involves more than just military forces. The climate-altered world of 2035 will force countries to reassess how they can develop a more comprehensive approach to national security that harnesses resources from across the economic, social and industrial landscape in an approach that incorporates military, academic, diplomatic, health, social, cyber and even cultural inputs. Increased 'vertical' integration and cooperation between local, subnational and national elements will also be important, particularly for disaster-relief preparation and response. Realistic scenarios of disaster relief—establishing and running community services, engineering works, community evacuation planning, and the provision of critical services and telecommunications as well as finance for rebuilding—will need to be exercised with increasing sophistication.

The coming decades will also present opportunities for militaries to rethink their approach to basing and reserve forces. Over the longer term, force-posture reviews must go beyond traditional threat assessments and include climate-change scenarios. Australia provides an instructive example. In the 1980s and 1990s, the ADF relocated its main army combat units to the northern reaches of the continent: Darwin, Townsville and Brisbane. But the impacts of climate change have come to be most felt across the southern part of the continent, where most of the country's population and its economic centre of gravity is located. Mobilising regular combat soldiers across continental-scale distances is slow, inefficient and costly, so assigning military

reserves to disaster relief and emergency responses could be more effective. Reserve military bases could easily become community focal points for disaster relief command and control.

Climate change can influence base planning in other ways. It's well established that a military should reflect the values of the society that it serves and from which it's drawn. By 2035, adjustments to national economies to achieve net-zero emissions will be well underway. Militaries must start planning now to be part of that shift, leading by example and introducing their own net-zero plans. 'Net-zero bases' would be a good place to start, delivering both energy security and independence from the national grid. This thinking must also be embedded in scientific, industrial and operational defence capability, enabling the adoption of electric propulsion, electric combat vehicles and renewable logistics bases that negate the need for oil supply lines and deliver operational efficiencies and stealthier combat solutions. Full life-cycle climate and carbon analysis in military acquisition processes should become the standard by 2035.

It took the US military 27 months to develop a nuclear weapon.[10] Imagine a modern-day Manhattan Project focused on nascent but transformative propulsion technologies such as hydrogen fuel cells and next-generation batteries for ships, submarines, aircraft and armoured vehicles. Beyond meeting societal expectations, those technologies can bring significant war-fighting advantages, including by reducing vulnerable supply lines and the risk of detection. Leveraging the military–industrial complex to accelerate 'green R&D' could make both military and commercial sense in a way that the space race did in the 1960s and 1970s.

Tactical implications

Climate change will have a significant tactical impact on military bases, infrastructure, ports, training grounds, exercises and critical support infrastructure.

There are two aspects to this. The first is the threat that military bases face from direct climate hazards such as sea-level rise and extreme weather, including their inherent reliance on civilian infrastructure (water, sewerage, power, telecommunications) that's exposed to those hazards.

Addressing that threat requires militaries to develop climate resilience and adaptation plans. Those plans, which will be critical for business continuity, must be integrated with local, state and national adaptation efforts. Moreover, they must identify shared risks and critical upstream dependencies such as power supply, air and road access, water supply, sewerage and telecommunications. Adaptation planning and stress testing must be built into military planning throughout the 2020s, progressively updated and informed by the latest climate science.

Second, climate change will also affect military training. Fire seasons are becoming longer, affecting where and when militaries can train and placing greater restrictions on live-fire activities. Training safely in extreme conditions and developing equipment that can withstand those conditions will also be part of tactical resilience plans.

Conclusion

The 1985 Villach Climate Conference was a key step in galvanising global political action to address climate change.[11] Sadly, 50 years later, in 2035, the world will still be only at the starting line in the race to limit the worst effects of climate change. That race—requiring no less than the transformation of the global energy system—will take at least another generation. The Indo-Pacific is at the heart of this historic transformation, but the region's military forces are currently structured, equipped and driven by cultural mindsets formed in the industrial era. Those militaries able to adapt to the rapidly changing geopolitical currents of the 21st century—of which climate change is a key driver—will be hugely advantaged. This is, in many respects, the main game in the Anthropocene. But rather than confrontation, the hallmarks of this new era can become collaboration and cooperation, especially in response to climate change. Either way, the region's militaries will be centre stage.

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10. Great-power competition and climate security in the Indo-Pacific

Erin Sikorsky

In the past few years, much ink has been spilled by international relations and climate experts on whether tackling climate change is compatible with competition with China. At one extreme, there are China hawks who argue that climate change is a 'dangerous distraction' for the US Defense Department that weakens the American hand against China. At the other extreme are China doves, a group of whom wrote a letter in 2020 calling for an end to antagonism from the West towards China because it undermines global goals on climate.[1] The official US Government position under the Biden administration has largely been an attempt to have its cake and eat it too—collaborate and compete by separating climate change policy from other issues, such as human rights, trade and Taiwan. The Chinese Government hasn't been particularly keen to adopt that position.

This debate rests on the assumption that the behaviour of the US—whether adversarial or collaborative—is a central factor in Chinese decision-making on climate policy. It largely ignores China's understanding of the risks and opportunities posed by climate change and the need for energy transition, and doesn't acknowledge the possibility that elements within the Chinese Government may view cutting emissions and moving more quickly towards net zero as in China's own security interests. In other words, the Chinese Government is almost certainly well aware that it isn't immune to the stability and security risks posed by climate hazards and is studying those hazards in depth.

The climate hazards facing mainland China are well studied, including by the country's own scientists. For example, sea-level rise threatens millions of people in China's coastal megacities. By 2050, most of Shanghai could be under water at high tide, according to research by Climate Central.[2] China's own internal national climate assessment found that the country's sea levels could rise by 40–60 centimetres above 20th-century averages by the end of this century. An increase of 1 centimetre could cause the coastline to recede by more than 10 metres in parts of China.[3] Interior flooding is an additional problem for China, as observed in the subway flooding in Henan Province in the summer of 2021.

Climate change also threatens China's long-term food security. While the PRC has nearly 20% of the world's population, it has only 12% of the world's arable land—and much of that land is threatened by climate-change-driven drought. The 2035 scenario provided as a starting point for this volume posits an all-too-believable global food security crisis as an El Niño event affects the rice bowls of China and Vietnam. As a 2008 study commissioned by the US National Intelligence Council found, this type of food-security crisis in China would spur further rural-to-urban migration, increasing social and resource stress in the country's cities.[4] Reports suggest that Chinese Government officials are concerned about just such an occurrence and the impact it could have on stability within the country.[5] In 2017, Beijing signed a joint

statement with the EU acknowledging rising temperatures as a 'root cause' of instability, and the government worries about the potential challenges posed by the fact that the country's rural minority populations in places such as Xinjiang, Inner Mongolia and Tibet are highly vulnerable to climate shocks.[6]

The all-or-nothing framing (that is, either the US can compete with China or tackle climate change, but not both) not only minimises the domestic drivers of Chinese climate action but also misses the point that great-power competition on climate action could in fact benefit the planet. China scholar Scott Moore notes that President Xi Jinping 'views ambitious action on climate change as central both to his legacy as well as China's standing abroad', highlighting Xi's announcement of getting to net-zero carbon dioxide emissions by 2060 and no new financing for overseas coal-fired power plants.[7] As historian Adam Tooze argues, 'The future for Beijing's authoritarian China Dream looks far more uncertain in a world of runaway global warming.'[8] Additionally, the Chinese Government perceives leadership on renewable technologies as the key to growing its economic power and influence.[9]

For their part, leaders in the US have emphasised 'economic competitiveness' as a key driver for ambitious climate action. In April 2021, Secretary of State Tony Blinken echoed Moore's and Tooze's comments, but from the US perspective: 'It's difficult to imagine the United States winning the long term strategic competition with China if we cannot lead the renewable energy revolution. Right now, we're falling behind.'[10] Some experts have suggested that a more aggressive stance by the US, leading a coalition of like-minded democracies in support of a carbon tax, could raise pressure on Beijing to act while strengthening the US position.[11] Hence, great-power competition, harnessed correctly, could drive climate progress as countries try to outdo each other in technology and market share of renewables.

The 2035 scenario appears to reflect a version of this 'compete to save the planet' framing. In this scenario, both the US and China are likely to be relative winners, in that their economies and standing on the world stage benefit from the energy transition and they aren't feeling the worst of climate change's effects, compared to the most vulnerable nations. However, as the scenario suggests, the intersection of intensifying climate impacts and continued geopolitical competition is likely to create flashpoints for potential hot conflict, including over access to fish stocks, shared freshwater river basins and influence over other countries in the Indo-Pacific.

While the 'incident' in the South China Sea in the 2035 scenario—the fourth in less than a decade—isn't described in detail, it's very likely such incidents could relate to competition over access to rapidly dwindling fish stocks in the area. Stocks have declined by one-third over the past 30 years due to a combination of overfishing, pollution and climate change.[12] Coral reefs, on which the fish depend, are also declining and are likely to deteriorate further as the ocean continues to warm. Meanwhile, more than 50% of the world's fishing vessels are estimated to operate in the South China Sea,[13] and the Chinese Government uses such craft as cover for military or security activities.[14] Heavily armed Chinese military vessels often accompany Chinese fishers, and in April 2021 Vietnam accused a China Coast Guard vessel of sinking a Vietnamese civilian fishing boat near the Paracel Islands.[15] Fishermen from the Philippines, Indonesia and Taiwan have also reported aggressive and provocative action by the Chinese.

Between 2016 and mid-2021, Manila filed more than 100 protests against the Chinese Government for its actions in the South China Sea; one complaint in May 2021 cited the 'incessant deployment, prolonged presence and illegal activities of Chinese maritime assets and fishing vessels' in the vicinity of a disputed South China Sea island.[16] In 2020, the US for the first time took a clear position on maritime disputes over water and seabed rights in the region, when then Secretary of State Mike Pompeo asserted that 'Beijing's claims to offshore resources across most of the South China Sea are completely unlawful, as is its campaign of bullying to control them'.[17] While the probable primary purpose of the statement was to increase the political and economic costs of Chinese behaviour, it also suggests an increased willingness by the US to more forcefully defend its allies in the region when they complain of illegal behaviour by Beijing.

While the highest risk is concentrated in the South China Sea, tensions with China over fishing in other parts of the Indo-Pacific and East Asia are also likely to intensify by 2035. Reports indicate that Chinese fishing vessels have acted aggressively, illegally, or both, in or near the territorial waters of Japan, North Korea, New Zealand, India and Australia.[18] According to Spyglass, a fishing crime database compiled by Ecotrust (a Vancouver-based non-profit organisation), Chinese-flagged or -owned vessels accounted for 21% of global fishing offences logged by the group from 2010 to 2019, up from 16% the previous decade.[19] The US is likely to continue pushing back against what it perceives as illicit 'grey zone' activity by China under the cover of fishing and support the efforts of its allies and partners in the region to do so as well.

A second key flashpoint in the region, based on the 2035 scenario, is likely to be shared river basins, particularly the Mekong, shared by China, Cambodia, Laos, Thailand and Vietnam, and the Brahmaputra, shared by India and China. In each case, China controls the headwaters and is actively pursuing dam-building projects that will affect water flow downstream. China and India have a history of tense relations, and those tensions regularly erupt into violence on the countries' shared border, most recently in January 2021. Meanwhile, the states of the Mekong River basin are increasingly caught between China and the US, as each pushes its preferred multilateral arrangement for governing water in the region—the Lower Mekong Initiative for the US and the Lancang–Mekong Cooperation for China.[20] Competition between the two great powers risks further destabilising the region if Beijing and Washington try to force countries to choose sides, or block collaborative data-sharing mechanisms.

In each case, climate change is likely to increase the likelihood of instability and conflict when coupled with existing geopolitical and great-power tensions. Along the Brahmaputra River, climate change increases the risk of downstream floods in the summer monsoon season. Given existing Indian mistrust of China and China's intensive dam-building projects, it's possible that New Delhi could attribute such changes to water manipulation by Beijing. As a recent report by the Center for Climate and Security and the Woodwell Climate Research Center posited:

> As much as 65% of annual precipitation in the Brahmaputra River Basin falls in India, with China receiving only 21%. Thus China is not the origin of most flooding in the region. But a major flood event in India could be construed as deliberate Chinese flow manipulation, regardless of whether this is objectively true. This gap between reality and perception is just the sort of spark that could raise tensions and help ignite conflict.[21]

On the Mekong River, given the competing US and Chinese water-governance institutions, coupled with what the scenario identifies as increased violent extremist activity and ongoing instability in developing countries, it's likely that disinformation about river dynamics will thrive. China has already shown a propensity for misrepresenting the impacts of its dam-building projects and will almost certainly attempt to placate downstream countries with promises of economic investment and development. In 2019, the Mekong was at a historic low point downstream, and many news articles cited an El Niño-driven drought as a key factor. At the time, the Chinese Foreign Minister told *Reuters* that his country had 'overcome its own difficulties' to help other countries in the region. However, a later analysis by the Stimson Center found that China had received a normal amount of wet-season precipitation and that the severe drought conditions downstream were due to Beijing holding back water.[22] As with the Brahmaputra, a lack of shared data and transparency increases the risk of misattribution. As the impacts of climate change intensify on the river, untangling the causes of floods and droughts will become even more challenging and open opportunities for competing actors to assign blame and potentially risk conflict.

Finally, as the 2035 scenario mentions, the hazards and shocks brought on by climate change in the Indo-Pacific will increase the demand for humanitarian assistance and disaster relief (HADR) as well as support for adaptation and resilience, providing another pathway through which the US and China can attempt to build influence in the region. The disruption of supply chains and the precariousness of port access noted in the scenario will also almost certainly intensify competition between the great powers in the region. China has a history of leveraging development and climate-related support in exchange for other political goals. For example, in 2019, Solomon Islands and Kiribati both cited support from China for tackling climate risks as the reason they had strengthened their relationship with Beijing and downgraded relations with Taiwan.[23] If China follows through on its pledge to eliminate funding for overseas coal-fired power plants by substituting clean, renewable energy projects for them, that could also give it more leverage in the region.

For its part, the administration of President Joe Biden has proposed a range of actions by the Department of Defense and the Department of State to support Indo-Pacific allies and partners in tackling climate change. Those measures include building combined response capabilities for climate-related emergencies through ASEAN and the Pacific Islands Forum, sharing climate risk-assessment tools for military infrastructure and installations, and highlighting climate risks in regional high-level dialogues.[24] However, this focus on climate change as a national security priority has received pushback from some in the US who want to focus on the more traditional threat of China's growing military strength and increasingly aggressive actions in its backyard. Ironically, it's precisely because the US wasn't focused on climate change that Solomon Islands and Kiribati deepened relations with China in 2019—both countries noted that the US's pullout from the Paris climate accord contributed to their decision, as did a perceived lack of engagement from Australia and New Zealand on climate matters. This suggests that the election of another US President hostile to international negotiations towards emissions cuts could further strengthen China's position in the region between now and 2035.

These potential flashpoints underscore the necessity of developing a comprehensive approach to integrating climate change considerations into security operations and strategies in the region. States that don't bring a climate-change lens to their regional foreign and security policy will miss key factors accentuating the risks of great-power and geopolitical conflict in the Indo-Pacific; nor will they be as competitive for influence and access to resources. In the region, Japan has begun developing such an approach by including climate change in its 2021 Defence White Paper, and the country's Defence Minister has become a leading voice on climate security risks.

At the same time, it will be critical, if difficult, to prevent great power competition from impeding or distorting regional responses to climate shocks. The scenario notes that outside powers continue to provide HADR in response to climate hazards; in future, HADR missions will be most useful if they're not made contingent on taking one side or the other in the competition between the US and China. Given the likely intensity and frequency of climate shocks, poor countries in the region will have no choice but to accept help wherever they can find it and are likely to hedge between the two great powers as much as possible. There's potential for that hedging to create opportunities for collaboration between China and the US in HADR missions, although, given the current trajectory of the relationship between the two countries, that seems unlikely.

Overall, looking out to 2035, it's apparent that the best understanding of the trajectories for both climate security and great-power competition will come from integrating the two issues in a systems analysis approach. Scholar Jeff Colgan terms this mode of thinking about climate change as an 'altered landscape' that sees 'climate change not as an issue area at all, but as a pervasive background condition that is intrinsically connected to most other areas of interstate competition and cooperation'.[25] Using this lens, it's clear that climate-change-induced mass migration, diminished food and water security and resource and technological competition will shift power dynamics within and between states in the Indo-Pacific. A key tool for operating in such a landscape will be a better strategy within the security community for leveraging existing climate-change predictive capabilities that are getting better all the time. Knowing when and where to expect some of the developments described in the 2035 scenario, particularly the slower onset risks, will allow states to better prepare and ensure that great-power competition doesn't overwhelm or exacerbate efforts to tackle such risks.

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11. Digital disinformation

Timothy Graham and Ariel Bogle

It's the year 2035. Global temperatures have increased by 1.5°C, intensifying the frequency and severity of climate hazards in the Indo-Pacific region. While some nations in the Indo-Pacific have benefited from energy transformation and continuing technological changes, others have not. And yet, for a decade, news cycles have been dominated by regular coverage of severe storms, floods, tsunamis and bushfires that often stretch the humanitarian response to breaking point. The regional information ecosystem is also being tested: a near-constant state of emergency means that false and misleading information—whether malicious or not—spreads faster and further than ever before.

The events of 2035 bring new opportunities for collaboration between nations but also test relationships, and regional tensions are escalating. Confronting and adapting to the climate crisis requires global and domestic consensus-building on an unprecedented scale, but social and political polarisation and upheaval in various nations is undermining trust in institutions and threatening regional cooperation, as well as providing multiple avenues for adversarial exploitation of the information environment. Likewise, in moments of disruption, a variety of actors seek to take advantage—political extremists, populists and big industry, as well as foreign actors. Forms of social media, digital communication platforms and the press continue to be part of any crisis event—and bring new challenges to social cohesion and the health of democracies before and after climate disasters.

Media manipulation and social unrest

Rumours and allegations at times of disaster can cause problematic reactions by authorities and stoke anger and division. For example, during Hurricane Katrina in 2005, allegations of looting, typically made against black residents of Louisiana and mainly disproved afterwards, led to racially motivated violence and complicated the response of emergency services and law enforcement, reportedly causing resources to be misapplied.[1] Rumours about who is to blame for environmental disasters such as bushfires aggravate racial tensions and political polarisation in particular affected communities. For example, the trope that 'leftists' and 'ecoterrorists' lit fires has shown up in both Australia and the US, often spurred on by influential voices online and in the press.[2] Other false narratives blame Muslims and even China for lighting fires.[3] Misinformation can also undermine trust in emergency-response efforts. During the 2018 Kerala floods, for example, the Indian Army was reportedly forced to debunk a video in which a man wearing combat uniform shared disinformation about rescue and relief efforts.[4]

So, there's an established expectation of fake or misleading content shared online following a disaster. By 2035, however, emerging video and image editing technology makes the production of this content more easily accessible and less easily identifiable. In the 2020s, rapid advances in artificial intelligence (AI) and the professionalisation of online content production

mean that, with only a few clicks, online trolls can fabricate photos of people looting shops that are indistinguishable from real photos, or deep-fake videos of local politicians spreading false rumours that blame minority groups.

By 2035, the increased prevalence and untraceability of manipulated media becomes especially problematic, even as detection technology also advances. Much like the online mob responses to events such as the Boston bombing[5] or the roving mobs of armed locals who falsely believed Antifa was lighting wildfires in Oregon,[6] disinformation could inspire vigilantism in cases where possible 'blame' can be laid for an event (such as the lighting of a bushfire). Regional authorities face a monumental challenge due to the ease with which completely fabricated content, let alone inflammatory news and commentary, can be generated and spread to ignite existing tensions and divisions and mobilise groups to commit violence or real-world harm, complicating an emergency response. Although online community organising in response to disasters can be enhanced by emotionally charged media content that motivates people to take collective action, it's increasingly difficult to know whether an image is real or not—before it's too late.

The evolution of climate-change conspiracy theories

The Covid-19 pandemic demonstrated how conspiracy theories can be spread, adapted and exploited by a diverse set of actors during periods of confusion and upheaval—and how those messages can mobilise events offline, such as anti-lockdown protests,[7] 5G tower fires[8] and attacks on vaccine clinics.[9] While the challenges were specific to each country, the pandemic demonstrated weaknesses in the information ecosystem's ability to confront a crisis in which significant public decisions must be made and risked undermining population-level responses. In 2035, the increasing severity and rapidity of weather events will necessarily cause similar, and arguably more, uncertainty and social disruption. That provides fertile ground for conspiracy theories and extremist movements to flourish and evolve—and requires a speed of response on false and misleading information that authorities are likely to struggle to provide.

The scale of the regional disaster response required in 2035—large-scale government projects to build environmental resilience as well as regional partnerships to redirect resources and humanitarian aid—could provoke certain communities whose fears are harnessed by emotional messaging in the media and on online platforms. While such ideas might capture only a small section of the population, they can nevertheless have a disproportionate impact.

There's a history of conspiracy theories connected to climate change.[10] Many have been built around the idea that governments or shadowy actors are preparing to use the climate crisis as a pretext to restrict individual freedoms[11]—a narrative promoted by a number of influencers and media outlets from early in the 21st century.[12] For example, Agenda 21 is a non-binding UN resolution concerning sustainability. It's also the linchpin of a longstanding conspiracy theory that claims it's a plot to impose a 'totalitarian world government', among other threats.[13] The need in 2035 for the military to be first responders during climate crises may enhance that view for some. Likewise, climate denial alongside conspiratorial rhetoric has often been a feature of populist movements and has been regularly framed as 'the people versus the elites'.[14]

Against this backdrop, regional efforts in 2035 to promote sustainability and combat climate hazards are perceived and theorised by some to be globalist attempts to violate freedom and threaten national and cultural identities, and such perceived threats are exacerbated by worsening climatic conditions. This is a particular risk when climate adaptation and resilience initiatives are formulated without considering local dynamics and with inadequate consultation.

The social and economic disruption associated with more extreme weather as well as other eventualities on a warming planet, such as displaced populations and the spread of infectious disease, will also be harnessed by extremist movements. For example, a hodgepodge of so-called 'ecofascist' ideologies continue to tie far-right fixation on overpopulation and immigration to environmental degradation.[15] Thus, forms of ecofascism or other extremist ideologies are likely to be a growing regional concern in an era of climate refugees and social unrest, and along with those ideologies will come an increasing use of violence as a vehicle of political change. Political populists are also likely to seize on such 'anxieties', using the online information ecosystem to communicate with and provoke their followers.

State-based disinformation

As environmental catastrophes escalate in 2035, bringing new challenges for the distribution of resources, relationships between nations will come under increasing pressure. That dynamic will also play out in the information ecosystem. In 2035, states that haven't shored up governance structures, ensured the health of media ecosystems and built up trust in institutions through accountability and transparency will confront a range of escalating political and social weaknesses. Indeed, states will find that concerns about foreign interference in the digital realm must be balanced with confronting such domestic challenges that can not only cause social damage but also set the scene for foreign state and non-state actors to exploit. Likewise, some states in the Indo-Pacific will use the threat of climate and disaster disinformation as a pretext for limiting and harassing media reporters on those topics—a trend that's also been building since the turn of this century.[16]

Environmental issues have long featured in messaging during conflicts—as part of state propaganda but also due to the genuine environmental degradation caused by warfare.[17] In 2018, for example, during the Russian annexation of Crimea, a hacking group reportedly made the untrue claim that US secret services were helping the Ukrainian Government poison water supplies in eastern Ukraine.[18] In 2035, such claims will be a regular occurrence due to competition over land and water resources. States are likely to weaponise the leaking of 'government' documents to suggest that rivals are stealing water or planning oil spills to undermine alliances and social support. In some cases, disinformation about the environment will be used as a pretext for military build-ups in border zones.

By 2035, states will see significant changes in global supply chains and climate adaptation policies, with flow-on effects for other countries. Some countries will adapt well to the new *status quo*; others won't and therefore will be more vulnerable than others to interference from state actors seeking to undermine what they see as detrimental policies. Indeed, government

decisions aimed at addressing climate risks that could profoundly affect other states (the construction of dams, for example) may provoke electoral interference aiming to undermine candidates who back such policies. Building the environmental resilience and adaptation of developing states in the Indo-Pacific will also continue to be a key tool of diplomacy. Online information campaigns to praise and boost the 'benevolent' state will be part of the information ecosystem. While resource sharing will remain vital, such messages will also be used to undermine the perceived legitimacy of rival states if they're seen as unable to adapt to or protect their populations from climate risk.

Influencers and industrial climate disinformation

In 2035, online 'astroturfing'[19] campaigns by some fossil-fuel companies and lobbyists for emerging 'climate solutions' are a multibillion-dollar business. The message isn't that climate change isn't real, only that there are myriad uncertainties in proposed adaptations and resiliency solutions, and that their economic impact is untenable—except for the company's own solution. Advertising harmful products poses challenges in this new consumer landscape. Companies therefore ramp up less obvious modes of influence: investing heavily in the kinds of online influencer marketing seen in the 2010s and 2020s but adapted to new technologies;[20] launching advertising campaigns on lower tier platforms that fly under the regulatory radar and target more localised market segments; and using shadowy PR firms that deploy hundreds or even thousands of fake accounts to monitor online buzz about products and brands and to astroturf or greenwash public discussions and online reviews in order to control the narrative.[21]

As we look to 2035 from today, therefore, the question we must ask is: are our social-media ecosystems set up to support the kind of social and policy change we need to combat climate change? From the current vantage point, the answer is basically no—platforms *by design* incentivise disinformation because of their advertising-based profit models, which optimise user engagement over quality of information. If unaddressed, this poses a vulnerability that unscrupulous lobbyists and corporations can continue to exploit through environmental influence campaigns, alongside other malicious actors.[22]

Influence operations—whether politically or economically motivated (or both)—often exploit newer, smaller and more niche platforms as 'trial balloons'[23] to see what kinds of content and narratives get the most engagement, and to optimise that content for deployment on larger platforms, where large-scale amplification can occur. Tracking such campaigns is very difficult, particularly where such spaces are designed to encourage anonymous participation. Compared to the early 2020s, influence operations in 2035 use advanced data science approaches for microtargeting populations and measuring impact. Further, they're better equipped to circumvent AI- and keyword-based platform moderation by co-opting organic communities to spread climate-related disinformation and preferred narratives. While the detection of such activity has also improved by 2035, platforms and lawmakers struggle to trace the origins of influence campaigns precisely because such operations have greatly improved their techniques of hiding within and exploiting organic flows of content and actors across a diverse social-media landscape. AI-driven detection models alone can't win this digital battle.

It needs extensive human resourcing—moderation teams attuned to the cultural and linguistic specifics of regional and localised online communities that malicious actors actively exploit and hide within.

In the Indo-Pacific, nation-states, lobbyists and state-backed companies are likely to continue to protect key and emerging industries that can have severe environmental impacts—in Australia, for example, certain mining sectors,[24] and, in Indonesia and Malaysia, palm oil. This is likely to involve attempts to shield such industries from reputational damage or proactively fight restrictions and sanctions, continuing decades-long practices, which include astroturfing by industry proponents on social media.[25] Regional digital disinformation of this variety bumps up against the calculus of national economic security—the difficulty is that cracking down on corporate astroturfing can potentially damage regional economies or at least *be perceived to*, so governments aren't always motivated to push for regulation. Pushing back on such campaigns can also be perceived as foreign intervention in the affairs of another country and clashes with growing nationalistic sentiment.

How do we minimise the disinformation impacts of 2035?

In advance of 2035, countries in the Indo-Pacific must prepare their information ecosystems for a period of immense disruption. We need much greater recognition of how political polarisation leaves us vulnerable to state-based and domestic disinformation. Foreign adversaries look for cracks and weaknesses in society, which they exploit by weighting the divisions on both sides and driving a wedge to further deconstruct social cohesion and trust in government and public services. We must face the fact that the enemy is often also *us*, which is to say that false information about environmental issues spread domestically by politicians, celebrities and issue-motivated media personalities is just as much—and arguably more—of a problem than foreign actors such as Russia or China.[26]

Therefore, no matter what the digital landscape looks like in 2035, climate-infused disinformation will flourish if we don't act by reducing political polarisation; addressing the risk of media and social media monopolies that mislead the public for economic or political purposes; developing tax and revenue structures that reward creators of high-quality content; adequately funding non-partisan public broadcasters and independent journalism; addressing the growing problem of homegrown disinformation, including from populist politicians and high-profile celebrities and influencers; and ensuring that the regulation of online information ecosystems is transparent, accountable and non-partisan and isn't used as a pretext to reduce scrutiny and criticism.

Lawmakers and regulators must continue to pressure and work directly with social-media companies to build special protections not only around elections but also pivotal events such as conflicts, crises and climate-related multilateral negotiations. Such moments carry a much greater risk of disinformation and social unrest or even violence, particularly where domestic or intra-regional conflicts are already occurring.[27] An acute challenge—particularly in countries that have used media and social-media regulation to crack down on dissent—is how to bring

governments and civil society in as stakeholders so that such protections benefit and are accountable to society broadly, not just the powerful. Strategies could include addressing platform business models as well as features that are easily gamed by influence operations and employing staff who have local cultural knowledge and linguistic capabilities to identify problematic content, particularly when it risks inciting violence. In addition, platforms need to provide more data to researchers and policymakers. Without access to social-media data, including detailed metadata about signals that are used to optimise recommender systems and content-curation algorithms, we're left in the dark and largely dependent on companies to regulate themselves when it comes to disinformation, about the climate or otherwise—that approach isn't working now, and the situation will be a lot worse in 2035 if we don't change it.

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Part 4
Economic disruption and climate change in 2035

12. Geopolitics of the energy transition

Maria Pastukhova

While multiple factors have been considered in the development of this picture of energy transition in Asia and the Pacific by 2035, I've focused on selected factors with arguably the highest impact on the overall development of energy systems in the region and the highest levels of uncertainty when it comes to their development: energy price development, access to finance, the speed of the renewables rollout and the willingness of countries to coordinate responses to climate risks and cooperate on energy security and transition (the geopolitical climate). I've also considered key trends that are shaping the region's energy systems: energy demand (projected to grow drastically), the concentration of energy demand in urban areas (high, projected to grow further in the coming decade) and the vulnerability of power infrastructure to climate impacts (high). Finally, this scenario assumes that the nationally determined contributions (NDCs), fossil-fuel phase-out and clean-energy finance goals announced by the countries of Asia and the Pacific at the UN Climate Change Conference in Glasgow in November 2021 (COP26) will be substantiated by the necessary policy and regulatory reforms of the respective governments. I've written on a chronological timeline to 2035 for greater clarity.

Years of stated ambition, lack of delivery: 2022–2025

In late 2022, the Asia–Pacific region re-emerges as the global economy growth centre as it recovers from the global Covid-19 pandemic and a protracted energy price crisis and prepares to deliver on the 'decade of action'. The commitments and goals announced at COP26 created a new momentum for the energy transition in the region. Following their pledges to phase out coal power by the 2040s and boost clean power generation,[1] Vietnam and Indonesia embark on a set of policy reforms aimed at a partial liberalisation of the power market and a more open investment climate for the renewables sector. In addition, Indonesia, as the host of the 2022 G20 summit, puts the need to reduce the energy intensity of the global economy on the global agenda anew and brokers the launch of a new global initiative to boost the energy efficiency of the heavy industry sector, supported by the world's largest economies.

The early 2020s see the emerging battle for regional dominance between two continental powers—China and India—which increasingly takes place in the energy and low-carbon tech sector. Upon securing support from the developed countries and major finance institutions for its 'One Sun One World One Grid' connectivity vision, India develops its own road map for boosting power-grid connectivity in the region and launches a series of high-level dialogues with neighbouring countries, with a particular focus on the Southeast Asian neighbourhood and the ASEAN community. Power-grid connectivity is announced as a strategic foreign policy priority by India's newly elected government in 2024, with the triple goal of expanding the country's geopolitical influence in the neighbourhood, boosting power-grid flexibility to achieve national renewable goals, and creating a regional market for Indian solar panel production. At the same

time, China boosts its investments in cross-border and large-scale national power-transmission infrastructure in its neighbourhood, to 'green' the Belt and Road Initiative and implement its own connectivity vision within the 'Global Energy Interconnection' plan.[2]

Although the 2020–2022 energy price crisis resulted in a series of power-supply disruptions to major Asian markets, most notably China, at the same time it delivered a short-term boost to the fossil-fuel markets of several Southeast Asian producers, most notably gas exporters Indonesia, Malaysia, Myanmar and Brunei. Indonesia's coal benchmark price exceeds the 2021 level to reach a record US$165 per tonne as China ramps up coal purchases to alleviate its energy supply crunch.[3] While less affected by the energy price crisis, those countries conclude that it's necessary to further boost domestic oil, coal and gas production—both as a source of revenue and as a strategic resource in case of further crises. While pursuing a clean-energy agenda in cooperation with the EU and the US, which continue to shift their own diplomatic and financial resources away from fossil fuels, Indonesia, Myanmar, and Malaysia double down on their political support for domestic oil and gas production. This conservative energy-security paradigm is met with enthusiasm by Japan, the only G7 country still providing international public finance to upstream fossil fuels. Loans and grants from Japan's private and public banks flow into the Southeast Asian gas sector as Japan aims to both diversify and boost its own gas supplies and lay the groundwork for its own hydrogen vision, dominated by 'blue' hydrogen.

Continued reductions in the levelised cost[4] of electricity generated from solar and wind power provide a powerful signal to both public and private finance institutions and the energy industry, and finance flows into clean energy rapidly.[5] Approximately US$1.2 trillion is invested annually in clean electricity supply between 2023 and 2026.[6] Climate risk and its social costs become an inherent part of any major investment decision in private energy finance, but emerging markets and developing economies are barely feeling the shift of global finance to clean energy. OECD-led public finance institutions fail to deliver sufficient support to the developing countries in Asia and the Pacific, which is urgently needed to spur required regulatory changes and address the high cost of capital and high-risk investment environments in those countries. Private finance flows continue to be directed towards the mature markets of industrialised countries, China and India. Cambodia, Laos, Myanmar and Thailand are unable to significantly ramp up the deployment of clean power generation capacities, as their federal budgets are under stress due to massive fossil-fuel subsidies, and international support is insufficient to unlock the change. Some growth of clean-energy infrastructure is being seen in Indonesia and Malaysia. Meanwhile, a true renewables boom takes place in Vietnam—one of the few developing countries in the region that has managed to proceed with an ambitious power-sector decarbonisation agenda, building on a high-paced deployment of renewable power, sustained GDP growth and policy reform that enhanced Vietnam's business environment in the early 2020s.

The several years of the recovery after the global economic crisis caused by the Covid-19 pandemic mark an exponential growth of energy demand in Asian economies. Southeast Asia remains the region with the fastest growing electricity demand (7% on average between 2022 and 2025).[7] One of the world's regions most exposed to extreme heatwaves, Southeast Asia

sees a particularly strong growth in electricity demand for residential cooling; the ownership of air conditioners expands by 25% and related electricity consumption by approximately 33% within four years.

Energy infrastructure under extreme strain, climate vulnerabilities show: 2026–2030

These several years of mixed progress and gradual but fragmented delivery of decarbonisation goals are interrupted by yet another energy supply crunch, which, combined with the series of extreme weather events in early 2026, exposes the vulnerability of major Southeast Asian economies to continuously intensifying climate impacts. While China and Laos face severe power shortages due to several months of extensive drought, electricity demand is skyrocketing in the main load centres throughout the region, including in neighbouring Thailand, Myanmar and Vietnam, which are also exposed to extreme heatwaves throughout the spring and summer months. The summer of 2026 goes down in history as one of the major public health crises in the region, as hundreds of millions remain without much-needed electricity supply in the densely populated urban areas due to overloaded power grids and resulting wide-area blackouts. An emergency session of ASEAN in 2026 highlights the need for greater efforts to strengthen the resilience of the power-grid infrastructure and to secure support for the most vulnerable communities. The meeting launches the first regional initiative on grid resilience as a supplement to ASEAN's power-grid plan.

A group of major development finance institutions led by the Asian Development Bank and the World Bank, joined by several OECD countries, pledges a substantial support package to alleviate the impacts of the crisis. However, cooperation efforts don't proceed as planned in 2027 due to the need to tackle a further, even greater, humanitarian crisis. A series of typhoons sweep away several densely populated coastal areas in the southern Philippines, forcing the mass displacement of more than 100,000 people over the autumn months, who, lacking the supply of basic necessities, migrate to the main island in search of new livelihoods. The already overstretched power and water supply system of Manila is under extreme strain due to the migration waves, and social unrest grows. Continental Asia isn't spared either: floods destroy large parts of the critical infrastructure in Ho Chi Minh City, and a coastal flood submerges approximately 15% of Bangkok for several weeks.

The crisis years of 2026 and 2027 induce a major shift in the energy planning of the most affected Southeast Asian economies. First, preventive population relocation efforts start taking off in the most exposed urban centres, which are now being rapidly expanded inland. The need to urgently address the growing demand for cooling has been acknowledged as the highest priority by all ASEAN countries, and national initiatives to boost cooling efficiency in both the residential and the commercial sectors are launched. While the private sector is cautious about investing in energy infrastructure due to the very high perceived climate risk, the real estate sector starts to attract major international investors. With the relocation of major urban areas underway, the region's finance needs for the expansion of power-supply infrastructure surpass even the most ambitious estimates. While the OECD-led public finance

institutions continue supporting energy-sector development in Southeast Asian countries, the limited available funds are channelled into humanitarian assistance and 'best practice' small-scale renewable power supply projects for rural areas, linked with some regulatory and technical assistance. Meanwhile, China's national banks and state-owned utilities step in as major financiers of large-scale power-supply infrastructure.

The new transition push takes place—too little, too late: 2029–2031

The year 2029 delivers the most ambitious set of global commitments yet to boost resilience and support the transition of the developing and least developed economies, as the stocktake of the 2030 Sustainable Development Agenda reveals major gaps and lack of progress—particularly in closing the gap on access to reliable, affordable and modern energy (SDG 7). A global initiative is launched by OECD countries, China, India and all major multilateral development banks to radically ramp up political and financial support for developing countries. By 2032, US$300 million of public finance for loss and damage can be delivered to developing countries to cope with climate impacts, and major support packages are delivered to the most vulnerable communities in Cambodia, Laos, Myanmar and the Philippines. For the first time in history, annual investment in clean energy reaches US$3.5 trillion.

Indonesia, until now spared from the worst climate impacts, manages to decommission a quarter of its coal capacity and gradually builds a solid renewable base. Both large-scale and rooftop solar and offshore wind generation capacities now cover 24% of the total energy supply. However, the space for renewables growth remains limited as the share of gas consumption in Indonesia's power and industry sectors continues to grow in the absence of demand-side management and policies that enable a rapid shift to renewable power generation. That dynamic is further exacerbated by Japan's investments in new gas supply and infrastructure, aiming at hydrogen production and export. Gas-based hydrogen production and export to Japan haven't lived up to expectations because the commercialisation of carbon capture and storage technology hasn't succeeded at the pace required. To cash in on otherwise stranded assets, Indonesian gas companies push for further gas exports to China and Japan, feeding the rest into the domestic power sector.

Vietnam, despite the devastating humanitarian crises of the late 2020s, manages to retain its position as the region's new leader in power-sector decarbonisation. Renewables account for over 25% of Vietnam's total power generation by 2030.[8]

The region experiences several years of steady recovery in the early 2030s. However, although highly welcome and efficient, the new global support measures still prove to be insufficient to prepare the region for the fateful year of 2032, which is marked by a succession of El Niño and La Niña phenomena unprecedented in magnitude.

A cascade of humanitarian crises surpassing the wave of the late 2020s sets back what little recovery had been achieved in recent years, as the extreme heatwaves and droughts caused by the 2032 El Niño, followed by a long period of extremely heavy rainfalls and floods due to La Niña in 2033, unleash a region-wide humanitarian and food-security crisis. While inland

rural areas in many countries are now equipped with distributed, renewable-based power-generation systems and can manage the impacts, the crisis hits the densely populated urban areas. Lacking access to basic services (cooking, cooling, lighting, health care), the poorest groups in Bangkok, Hanoi and Jakarta leave the slums to move to rural areas, straining unprepared small-scale energy systems and adding to social unrest.

A region in transition: 2035

In 2035, energy systems across the whole region are under extreme physical and economic strain due to the severe and intensifying impacts of global warming, which has now reached 1.5°C above pre-industrial levels. Southeast Asia—one of the planet's regions most vulnerable to climate change—is struggling the most due to limited access to public and private finance to boost the resilience of the region's emerging and developing economies and to speed up the required systemic shift to more decarbonised economies. The largest energy demand centres (Bangkok, Jakarta, Ho Chi Minh, Yangon) and other coastal cities are in the middle of a massive relocation inland, as neither the centralised power-supply systems nor cooling and heating appliances can withstand the pressure of repeated floods. The transfer of commercial and public-sector operations of Bangkok to areas away from the coast, going on for several years now, has become a 'black hole' for the national budget, as the costs of expanding power-supply infrastructure are skyrocketing.

Renewed efforts by the region's governments to adapt to the ongoing economic and climate crisis also create new opportunities. In 2035, Southeast Asia is among the most dynamic real estate markets globally as the demand for new, energy-efficient residential and commercial buildings in urban areas finally speeds up, supported by strong government policy efforts to create enabling regulatory frameworks and attract investments to the sector. A wave of policy reforms aimed at easing access to rooftop solar and small-scale power grids for rural areas and at unlocking investments in large-scale power grids and wind-generation facilities takes place in most Southeast Asian countries between 2032 and 2035. Solar and wind power take off as dominant sources of electricity in some countries of the region, led by Vietnam, which is now producing nearly 40%[9] of its own power with renewables. Indonesia shows progress as well, as 27% of its power mix is now covered by solar power and increasingly by offshore wind-power generation.

Yet progress is fragmented, hampered by the protracted energy price crisis and regularly set back by the aggravating effects of ever-increasing typhoons, floods and heatwaves. The national budgets of Cambodia, Thailand, Philippines and Myanmar, all of which are dependent on coal, oil and gas imports, are under extreme strain as energy subsidies exhaust themselves as a means of economic support to vulnerable groups and industry alike. Only a fraction of the four countries' national budgets is available for refurbishing and replacing ageing and unstable power-supply infrastructure, and the lion's share is routinely channelled to rebuild energy infrastructure in regions shattered by natural calamities. However, those efforts on the ground aren't enough to narrow the ever-widening energy access gap, let alone close it. Poorer population groups are particularly exposed to health and security risks—an average of

120,000 deaths are attributed to the lack of clean cooking and 3,500 deaths to heat strokes (and lack of access to cooling or energy-efficient residential spaces) are registered in the most exposed countries: Cambodia, Laos and Myanmar.[10]

The energy transition and the shifting geopolitical balance

The energy market and policy developments are central factors shifting and shaping the geopolitical balance in Asia and the Pacific in general, and Southeast Asia is transforming from a 'maritime periphery' for the major regional powers to a place of great-power competition on energy standards, finance and political influence. China, which has been historically dominant in Southeast Asia's energy system planning through close links to regional governments, utilities and state-owned coal, oil and gas companies, has managed to establish itself as the standard-bearer in the increasingly decarbonised energy sector. Investing heavily in national power-transmission lines in neighbouring Myanmar and Cambodia, China's State Grid Corporation owns, through *de facto* means, over 70% of newly constructed transmission lines and dictates standards on cross-border trade in power with those countries. Over 60% of international public and nearly 95% of private finance in Laos and Cambodia originates from Chinese financial institutions, monetising the strategic location of those neighbours and taking advantage of southern China's lower climate risks and a finance gap left by OECD public finance institutions and commercial banks. The successful energy transition and climate resilience of its southern region is one of China's security priorities, as climate migration leads to tensions at its southern borders, and its major low-carbon technology production centres, most now located in Vietnam, Myanmar, Cambodia and Malaysia, are increasingly exposed to climate impacts, threatening Chinese companies with supply disruptions and loss of capital.

India's presence in the region has grown considerably over the past decade, particularly within the India–ASEAN Power Grid connectivity initiative and within various power-grid cooperative initiatives. The third-largest manufacturing centre for photovoltaic cells and producer of over one-quarter of solar panels globally, India has become the primary supplier of solar-power equipment to OECD countries that are looking to diversify away from Chinese products and is in a fierce competition for dominance with Chinese equipment providers in Southeast Asia's renewable-power markets.

The region's dependency on China's supply of raw materials remains extremely high, as demand for lithium, silicon, nickel, copper and rare metals is on a rapid and steady rise. Other parts of the renewables supply chains have been redistributed, and Malaysia, India and Vietnam have joined the regional market as major solar-power equipment suppliers.

The global race towards affordable and scalable hydrogen production doesn't bode well for Southeast Asia, which is now left with a massive share of stranded assets in superfluous gas production sites and government debt owed mainly to Japan's public and banks. Japan has lost its bet on the rapid expansion of 'blue' hydrogen, as high hopes for a quick delivery of scalable and affordable carbon capture and storage applications have gone unrealised for over a decade now.

Conclusion

Although there are myriad possible development scenarios for the Indo-Pacific energy sector, the one outlined here is among those most probable unless decisive policy shifts take place in the countries of Southeast Asia and sufficient financial support from developed countries is granted. This scenario shows a series of messy policy actions, unchecked climate impacts and neglected vulnerable groups in a trend like the one that characterised the first two decades of the 21st century, with one crucial difference: sticking to a 'business as usual' scenario won't be possible in years to come. The extreme weather events, unchecked loss and damage and increased vulnerability of energy systems to the impacts of climate change no longer leave any room for *status quo* assumptions.

The region sees several geopolitical shifts as India rises as a major regional player and Vietnam and Indonesia slowly emerge as regional leaders. Yet, without major support from OECD countries and international finance institutions, Southeast Asia offers only limited space for the engagement of new players. In these circumstances, investment and political gaps are highly likely to be filled by China, using its historically established cooperation ties and its mature domestic renewables market, which is looking for outlets in the neighbourhood. Japan, in turn, is likely to remain a prominent regional provider of development aid and fossil-fuel finance, probably locking many countries in the region into several decades of growing gas and oil consumption.

Measures that can help to rapidly boost the resilience of the region's energy systems to climate impacts, alleviate the impact of market shocks and energy supply crunches, already exist today:

- In Asia and the Pacific, Southeast Asia, in particular, will be exposed to intensifying climate-change impacts of the coming decades. Strengthening the resilience of its energy systems—the region's backbone for socio-economic development—is a task of scale that countries won't be able to manage alone. Regional cooperation in risk-sharing and management mechanisms and disaster preparedness is key and must be embedded in a broader international cooperation framework.
- A massive shift of finance flows (both public and private) will need to take place to unlock access to low-carbon growth for the emerging markets and developing economies of Southeast Asia. Here, the role of public finance is the key for supporting regulatory and policy changes in those countries, thereby creating an environment that attracts private finance, which will otherwise remain concentrated in mature and developed markets. Climate risk assessment must become an inherent part of every investment decision taken by development banks in the energy sector (the multilateral development banks but also the public finance institutions of major financiers such as the EU, the US, Japan, China and Korea).
- The resilience challenge necessitates a systematic approach to the development of national and regional power-supply systems. National power-grid planning needs to work hand in hand with comprehensive and data-driven analysis of power-demand dynamics that take into account population growth, accelerating climate impacts (such as extreme heat) and

socio-economic development (such as greater demand for cooling, lighting, transportation, cooling for health-care and food supply chains). A smart energy planning process must enable the development of an integrated system, parts of which can nevertheless be decoupled from each other in case of an emergency to prevent a wide-area power outage. Furthermore, the introduction of smart metering systems not only allows for more transparency in energy-consumption data, but also enables service providers to pinpoint the sources of outages and address problems more quickly, as experience in other parts of the world shows.[11]

- Closing the gap on energy access and alleviating energy poverty, which is concentrated in rural areas, should be a key priority for Southeast Asian governments. Nevertheless, boosting the resilience of their densely populated urban areas (many of which are highly exposed to the physical impacts of climate change) is one of the most urgent priorities. On the one hand, major policy and financial effort is needed to keep the growth in electricity demand in check in order to ease the pressure on already strained power-supply infrastructure. Measures such as retrofitting residential, public and commercial buildings with better passive cooling, as well as incentives to encourage the take-up of more efficient appliances, should be introduced to reduce overall electricity demand. On the other hand, expanding the power-supply infrastructure and strengthening the resilience of households to withstand system failures by offering rooftop solar deployment and support programs as well as decentralised emergency back-up solutions is key.
- Introducing an ambitious timeline for the decarbonisation of power sectors is pivotal not only to mitigate the impacts of climate change but also to strengthen the economic resilience of Asian and Pacific economies to transition shocks. As continued reliance on the business-as-usual energy-supply model will no longer be an option, channelling further public investments into new oil and gas production risks depriving the Asian economies of much-needed funds to address the double challenge of speeding up the energy transition and boosting the resilience of energy systems.
- The structural shifts triggered both by the global energy transition and by aggravating climate impacts will inevitably lead to a geopolitical and geo-economic rebalancing, which could either empower or significantly hamper progress on energy transition in the Asia–Pacific region. It's critical for policymakers to ensure that the geopolitical shifts result in a 'race to the top' rather than a clash of standards on a range of critical topics, including the diversification and resilience of low-carbon supply chains and the parallel critical-materials markets, the operational and regulatory norms and standards of power-grid connectivity and the approach to clean-energy finance.

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13. Sovereign risk in the Indo-Pacific: avoiding the doom loop

Zoe Whitton and Arjuna Dibley

Sovereign risk and vulnerability

The economic fortunes of the Indo-Pacific region under the 2035 scenario will be dramatically shaped by sovereign risk. Sovereign risk refers broadly to the likelihood that the economic fortunes of a government or government body may decline. The term is used specifically in the capital markets to refer to the likelihood that a government or government body will default on a loan provided to it by a lender. Here we discuss the second definition, although we note that it is, in effect, an out-working of the first.

Governments have borrowed money from private and public lenders for centuries.[1] Creditors provide finance to government to help build major infrastructure, support essential services, fund military procurement and pursue economic growth, among other things, and in return are paid interest on that capital.

However, lending money to a government is qualitatively different from lending to an individual or a corporation. Governments have legal powers and immunities that individuals and business don't, meaning that seeking repayment can be more difficult if governments default on their loans.[2] Also, government financial affairs are more complex than companies', and are usually driven by the domestic economy and its interaction with international markets, geopolitics and geography. As such, sovereign risks might relate to a wide range of risks, from geopolitical conflict right through to the quality of the country's financial management. A number of parties (including lenders and credit ratings agencies) evaluate sovereign risk on an ongoing basis and often give governments and borrowing state institutions a rating based on their creditworthiness (deeming them AAA or BBB, for example).

Sovereign risk is obviously important for lenders. The lender faces the prospect that higher risk governments might not be able to make their payments or repay loans. Therefore, where sovereign risks are greater, lenders will generally demand higher interest rates before lending to governments as compensation for that risk. Furthermore, some governments and state institutions present too great a risk for lenders, relative to other investment opportunities, and lenders will simply refuse to lend.

Consequently, sovereign risks also matter for governments. This isn't just because sovereign risks reflect their own economic circumstances, but also because they can affect the availability and cost of accessing capital.[3] When governments can't easily access private capital, they lose an important source of funding. Therefore, one could say that sovereign risk cuts both ways—putting lenders and governments at risk.

That can be particularly evident and problematic for governments during crises. Consider the Covid-19 pandemic, for instance. During the pandemic, countries with lower sovereign risk ratings were able to access capital markets and quickly deliver massive stimulus, supporting public-health responses and keeping economies afloat. Meanwhile, lower income countries were unable to access such capital quickly and have been reliant on public financiers.[4] That has slowed their public-health response and will probably hamper their economic recovery.

Lack of private capital can thus have a cyclical effect, exacerbating the conditions that made capital difficult for governments to access in the first place and becoming another source of risk. This is an important feature of the relationship between climate change and sovereign risk, as it presents the risk of a type of 'doom loop' for governments that are very vulnerable to climate risk. High vulnerability can reduce access to capital, which in turn can constrain the government's ability to respond to, reduce or prevent risks.[5]

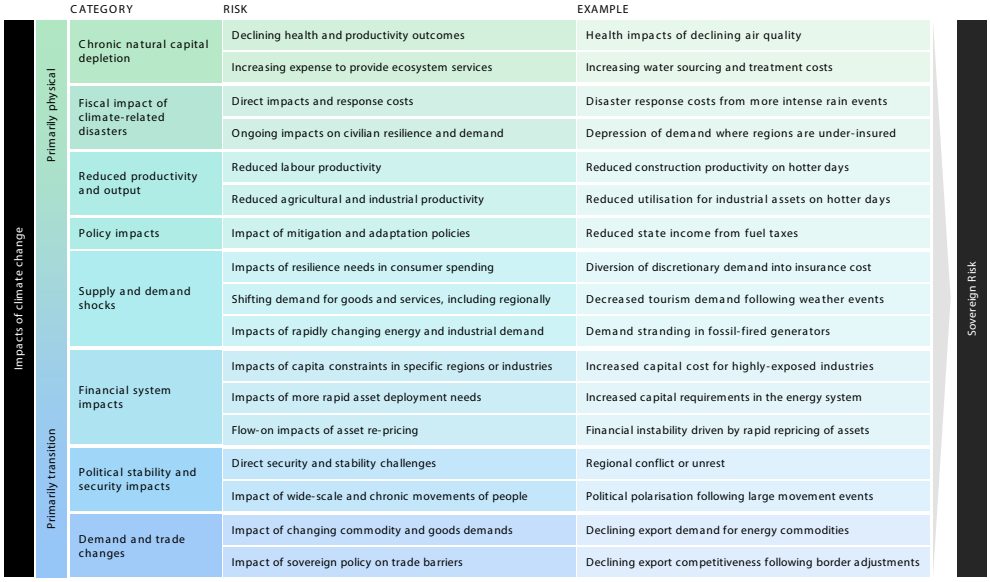
Connecting climate change to sovereign risk

Climate change is already having impacts on sovereign risk, and those impacts will grow in the 2035 scenario. There are three categories of climate-change impacts that can affect sovereign risks:

1. *Physical impacts:* As discussed in the scenario, climate change will create a range of physical effects that will affect the ability of governments to repay their debts over the short and long terms. Those effects include acute impacts (such as extreme storms) and chronic impacts (such as droughts).
2. *Transition impacts:* Countries also face a 'transition' because of climate change, as economic actors and societies try to rapidly decarbonise. Those climate transitions will affect national governments in important ways. For instance, governments and regions with exposure to emissions-intensive industries (such as thermal coal) face the potential risk of economic shocks, revenue base reductions or stranded assets as investors and consumers withdraw from such sectors.
3. *Liability impacts:* Increasingly, governments themselves are becoming the subject of lawsuits for failure to manage climate-change risks. The lawsuits create both direct and indirect costs for governments.

The scope of risks outlined above is wide and includes impacts on economic activity, the lives and economic prospects of citizens, capital markets and political stability. To better understand sovereign climate risk, it's important to understand the specific transmission pathways through which climate change affects a government's ability to repay its debt.[6] In this treatment, many of the risk pathways examined in depth in other chapters make up the individual transmission pathways through which climate risk becomes sovereign risk. Figure 1 summarises some of those transmission pathways.

Figure 1: Pathways through which climate risks are transmitted to sovereign risk



CATEGORY	RISK	EXAMPLE
Chronic natural capital depletion	Declining health and productivity outcomes	Health impacts of declining air quality
	Increasing expense to provide ecosystem services	Increasing water sourcing and treatment costs
Fiscal impact of climate-related disasters	Direct impacts and response costs	Disaster response costs from more intense rain events
	Ongoing impacts on civilian resilience and demand	Depression of demand where regions are under-insured
Reduced productivity and output	Reduced labour productivity	Reduced construction productivity on hotter days
	Reduced agricultural and industrial productivity	Reduced utilisation for industrial assets on hotter days
Policy impacts	Impact of mitigation and adaptation policies	Reduced state income from fuel taxes
Supply and demand shocks	Impacts of resilience needs in consumer spending	Diversion of discretionary demand into insurance cost
	Shifting demand for goods and services, including regionally	Decreased tourism demand following weather events
	Impacts of rapidly changing energy and industrial demand	Demand stranding in fossil-fired generators
Financial system impacts	Impacts of capita constraints in specific regions or industries	Increased capital cost for highly-exposed industries
	Impacts of more rapid asset deployment needs	Increased capital requirements in the energy system
	Flow-on impacts of asset re-pricing	Financial instability driven by rapid repricing of assets
Political stability and security impacts	Direct security and stability challenges	Regional conflict or unrest
	Impact of wide-scale and chronic movements of people	Political polarisation following large movement events
Demand and trade changes	Impact of changing commodity and goods demands	Declining export demand for energy commodities
	Impact of sovereign policy on trade barriers	Declining export competitiveness following border adjustments

Source: Adapted and extended from M Agarwala, M Burke, P Klusak, K Mohaddes, U Volz, D Zenghelis, 'Climate change and fiscal sustainability: risks and opportunities', CAMA working paper 80, Centre for Applied Macroeconomic Analysis, Crawford School of Public Policy, Australian National University, 2021, online.

The transmission pathways are highly varied. Some of the risks are very acute and direct, such as the impacts of natural disasters on governments, which often have to fund clean-up and recovery. Conversely, some of them are chronic and more indirect, such as the erosion of discretionary spending capacity likely to come in regions with ongoing increases in vulnerability and consequent needs for spending on resilience. Some are generated primarily by transition risk (for example, the impact of a changing energy mix on commodity export demand), while some are primarily physical (such as the impact of climate change on the availability of clean air and water when one needs it).

There are too many transfer mechanisms for us to unpack extensively here, but a few bear digging into, particularly with respect to the 2035 scenario.

- *Political stability impacts* are one transmission pathway worth highlighting with reference to the scenario. They're relevant both for chronic threats to security, such as the steady rise in extremism and terrorism. However, they also include acute political stability threats, such as those that are emerging in this scenario in the South China Sea. Research on this front has noted that, in addition to reducing food security and increasing disaster risk, climate change is likely to directly affect the extent of conflict between individuals and groups[7] and to continue to exacerbate the extent of regional inequalities.[8] Both forms of instability have direct effects on sovereign risk and are particularly pertinent in the Indo-Pacific. In October 2021, the US National Intelligence Council reviewed global risks to security stemming from

climate change, identifying two regions of great concern for security—Central America and Southeast Asia—and observing that Central Africa and the small island states in the Pacific were the most vulnerable regions in the world.[9]

- *Productivity impacts* are an example of a category of impacts that are often overlooked, being chronic and long-running. Climate change is expected to affect labour, agricultural and industrial productivity for a number of reasons.[10] Labour productivity is understood to be highly sensitive to high temperatures, and agricultural productivity is also directly affected by heat and by precipitation changes.[11] Finally, industrial productivity is significantly affected by weather extremes, partly because manufacturing, electricity generation, and airport and railway operations are often impeded by hot weather, reducing productivity. However, it's also a consequence of closure. Rail lines and other transport assets are regularly affected by specific weather events, including the extreme precipitation that will become more common as climate change progresses.[12]
- *Financial stability impacts* are another indirect transmission mechanism. For the past decade, many analysts and regulators have been highlighting the risks that climate change poses to financial stability in markets with significant exposure to activities such as fossil-fuel production.[13] In those jurisdictions (which include the UK, the US, Australia and Middle East nations, among a number of others), significant changes in the global energy mix could drive rapid changes in the value of a significant block of financial assets. That includes not only the producing assets themselves, but the value of providers of goods and services and debt and equity to those assets. In countries with significant exposure to those industries, such rapid changes could have knock-on effects that affect financial stability. Those cascading effects are far less likely where a nation has strong norms regarding climate risk analysis and disclosure in capital markets.[14] Nonetheless, in countries with significant fossil-fuel production activity, the risk of unexpected impairments may present financial stability risk.

As we've noted, those risks can also reinforce one another, and indeed other persistent economic risks and vulnerabilities. The interaction between regional climate risk and the impacts of the Covid-19 pandemic is one example.[15]

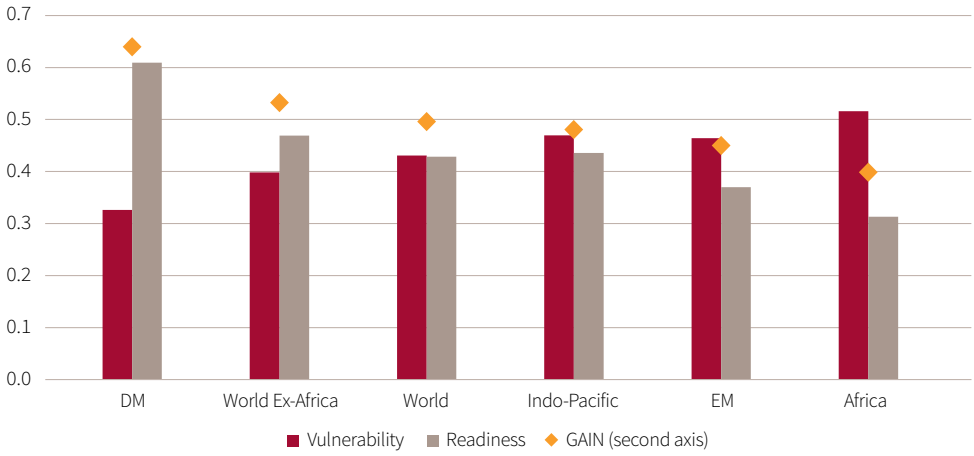
Many of those risks are already in play. In Figure 1, we've provided examples of different types of risk, and many will be recognisable to those who have lived through recent events. Although many of those effects are presently limited, their prevalence and the extent of their impact on sovereign risk will increase with the extent of climate change.

Sovereign climate risk in the Indo-Pacific

As noted throughout this chapter, climate risks are pertinent in the Indo-Pacific and have already had an impact on the cost of borrowing for countries in the region. That's in part due to their exposure to physical climate risk (they have significant population density near coastlines and a high dependence on climate-exposed industries) but also due to the level of vulnerability in the region.

These combined effects are evident in global comparative risk-scoring exercises. Take the Notre Dame Global Adaptation Initiative (ND-GAIN) risk index, for instance, which is one of the most widely used comparisons of a country's vulnerability to physical climate change risks in combination with its readiness to improve resilience.[16] The Indo-Pacific risk scores in the ND-GAIN index fall marginally below the world average, but to a greater degree below the world average that excludes Africa (Figure 2). Because the Indo-Pacific comprises countries at markedly different stages of economic development, Figure 2 underemphasises the significance of climate risks in some countries in the region. Outside Africa, Indo-Pacific nations are nine of the 20 highest-risk jurisdictions, another three of which border the region. The index doesn't consider transition risk, so it's also worth noting that the region is home to several major energy producers and a large number of emerging markets that are likely to find themselves challenged by transition efforts.[17]

Figure 2: Regional vulnerability and readiness to climate change and overall risk score in 2019



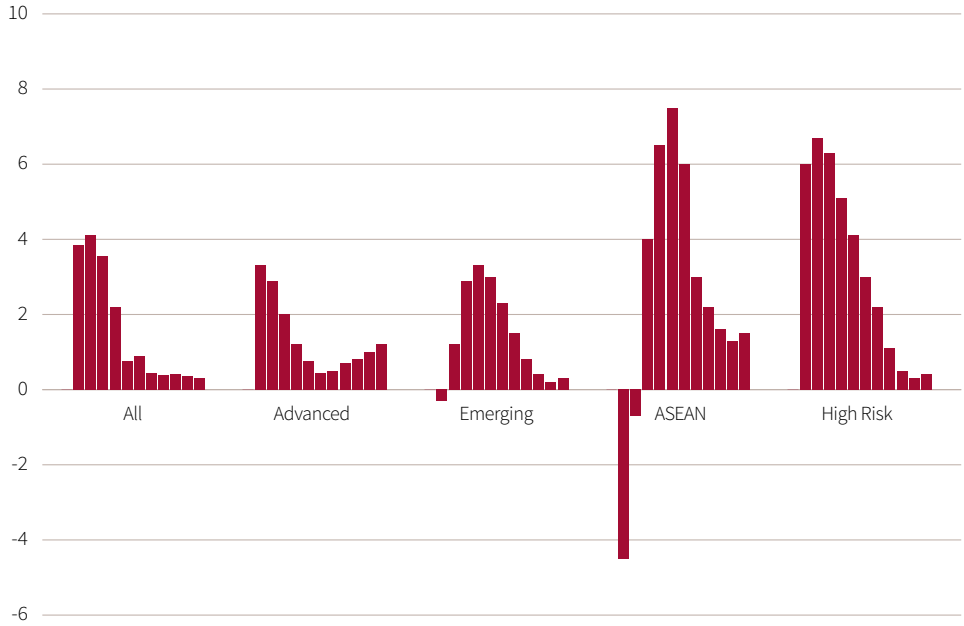
DM = developed market; EM = emerging market.
Source: Data from 'Country index', ND-GAIN, online.

The vulnerabilities of Indo-Pacific nations to climate change have distinct consequences for their sovereign risk. Researchers and actors within capital markets continue to improve their understanding of the way that climate change affects sovereign risk and the consequent impacts on the cost of capital.[18] That research indicates the significance of climate risk for sovereign economic fortunes and creditworthiness, using both rear-looking analysis and forecast impacts. The work has primarily focused on physical climate risks but is nonetheless illustrative for the region.

One important conclusion that emerges from historical analysis of the cost of accessing capital by national governments is that nations in the Indo-Pacific region have already experienced larger impacts on their costs of borrowing than other regions following climate-related shocks. John Beirne et al. examined impacts on those costs of shocks to climate vulnerability and resilience in the period from 2002 to 2018 ranging across 40 countries, including both developed

and emerging markets.[19] They found that vulnerability to the effects of climate change has been an important driver of the cost of capital at the global level, indicating that climate risk is already affecting sovereign risk. Furthermore, the sample shows that the impact of climate-related shocks on costs of capital for ASEAN and high-risk countries is significantly greater than for global, advanced or emerging categories, and that 70% of the high-risk category were in Indo-Pacific (Figure 3).[20] Emerging work on the future impacts of climate change on sovereign risk paints a similarly bleak picture for the region,[21] particularly when natural disasters interact with other economic shocks, such as pandemics.[22]

Figure 3: Impulse response of bond yields in the first 12 months following a climate shock in specific regions



Source: Data from J Beirne, N Renzhi, U Volz, 'Feeling the heat: climate risks and the cost of sovereign borrowing', *International Review of Economics and Finance*, 2021, 76:920–936, online.

How to address and manage sovereign climate risk

How should countries in the Indo-Pacific react to the sovereign risks that they're already facing, and will continue to face, because of climate change? Dealing with sovereign risk appropriately requires governments to take sufficient measures to reduce their vulnerability and increase their resilience to climate change. Reducing such vulnerability at a regional level will also reduce the likelihood that countries will experience the impacts described in the 2035 scenario.

Dealing with sovereign risk can also ensure that nations maintain access to capital, which they'll need to maintain resilience and adaptive capacity should they face a scenario such as this. This reinforcing relationship between risk and access to capital means that it's vitally important

to consider the measures available to governments to manage and minimise their sovereign risk exposure. This is especially important if sovereign risk exacerbates vulnerability in scenarios such as this one.

Risk disclosure alone is insufficient for the unique nature of sovereign climate risk

Governments have increasingly sought to use disclosure as a mechanism for managing climate risks.[23] In particular, governments have indicated that they'll try to adapt the Taskforce for Climate-related Financial Disclosures (TCFD)—a global industry-led initiative outlining an approach for companies to understand, report and manage their climate risks—as a tool for making such disclosures. However, the TCFD alone has significant deficiencies for national governments.[24]

The TCFD was designed to ensure that capital markets have sufficient information about potential climate risks to their investments, and therefore the capacity to manage those risks.[25] The problem that the TCFD attempts to solve is to give capital holders, regulators and other market participants access to previously unavailable information so that those participants can assess and ultimately price climate risks.[26] This can be effective in capital markets because decision-makers in those markets are actively responsible for system risk management and because the interaction between capital providers and companies can prompt risk management within companies themselves. Thus, in capital markets the TCFD functions as a tool for system risk management and prompts individual entities' risk management.[27]

However, the relationships that sovereign governments have with capital markets and the risks they face are notably different on a number of fronts:

- First, the engagement between capital providers and governments occurs on different terms, and governments aren't necessarily able to alter their behaviour in response to engagement from capital markets for reasons related to the immunities of states, the structure of the country's economy, politics and geography. For example, a country in the Pacific might be highly exposed to physical climate risks, but it can't adjust its location to better manage such risks. Further, it might not have access to resources to reduce its risk exposure. Consequently, even if capital providers have more information, they might not be able to influence the government in a way that encourages it to manage its climate risks, and efforts to do so may be politically sensitive. In this context, the TCFD or other disclosure mechanisms may provide a consistent framework for the government to carry out internal risk assessment and management. However, those measures alone are unlikely to encourage or enable the government to better manage risk.
- Second, although capital markets often think of governments as individual entities, they're of course economic systems in themselves. Governments are effectively what we might call universal owners (they have exposure to everything within their national borders and much beyond them besides). This is important because, while the TCFD tends to be good at managing entity risk, it isn't as useful for reducing system-wide risk.

- Third, unlike shareholder-owned companies, governments are responsible to a broader range of stakeholders. The role of governments isn't to provide value to their shareholders but to deliver public goods on which all people and ecosystems rely, and to broker the management of different interests through politics. They're also often capital providers and insurers of last resort. For that reason, governments may have incentives to absorb and manage climate risks internally, and certainly shouldn't be responsive to the needs and interests of just one stakeholder.

Therefore, although the TCFD is useful for government as a framework for internal risk management, it's but one tool that governments could and should use.

Governments should use their unique capabilities to manage climate risk

Governments have a range of risk-management levers available to them that privately held corporations don't. Unlike private corporations, which can influence only their own corporate strategies and how they engage with others, states have a wide range of powers available to them to influence both the government institutions under their direct control, other governments to which they lend money and the private actors within their jurisdiction.

The range of levers that governments could use to manage climate risks include the following:

- *Introduce policies that incentivise emissions reductions at home and abroad.* Ultimately, there's only one way to eliminate sovereign physical climate risk and that's to reduce and remove global emissions. The best way to do that within the control of governments is to introduce policies to reduce emissions and to support other countries to do the same.
- *Mandate that state capital providers, state-owned corporations and other state asset holders take steps to reduce climate risks.* For instance, governments could introduce mechanisms to reduce climate risk in such entities in a coordinated and phased way from the top down, rather than the bottom-up approach currently used in capital markets, in which corporates disclose their climate risks.
- *Use public institutions in a way that influences other actors in the economy to reduce climate risk.* State capital providers, like sovereign-wealth funds and pension funds, should take market-leading positions in risk management. Other government entities could also put conditions into procurement contracts to prioritise suppliers who currently manage climate risk and provide support for suppliers to manage such risk.[28]
- *Ensure that public risk-management and risk-transfer mechanisms support climate risk reduction rather than exacerbate it.*[29] This might include building up disaster risk-resilience funds to ensure that sufficient capital is available to manage disasters.[30] Governments could also ensure that moral hazard risks are avoided through public insurance schemes.[31]
- *Use regulatory powers to incentivise climate risk reduction in private markets.* This includes carrying out economy-wide climate-risk exercises and providing data to market actors to assist them to manage their climate risk, as well as encouraging financial markets to mandate climate risk disclosure.[32]

- *Pursue economic diversification, including by increasing 'green complexity'.*[33] This includes using fiscal policy mechanisms to encourage climate-friendly innovation in the economy.[34] Removing subsidies, guarantees and other state support for high-risk activities (including fossil-fuel subsidies) is a complementary action.
- *Use influence as a lender to encourage other states to better manage climate risk.* Advanced economies in the Indo-Pacific—such as Australia—could use their leverage as lenders to other governments to support greater climate risk-assessment and resilience efforts. For instance, governments could use their participation in development finance institutions, their role as sovereign creditors in capital markets and their bilateral aid programs to encourage governments in the region to manage their climate risk exposures. This could include using debt-for-climate swaps to forgive existing debt in exchange for debtors taking steps to prepare for climate risks.

This range of activities, which we call a 'beyond-TCFD' approach to sovereign risk management, may seem extreme, or at least ambitious. However, the risks presented by the 2035 scenario are severe and pose significant risks to governments, businesses, investors and, most importantly, people in the region. Just as governments increased their level of economic intervention in the face of the Covid-19 pandemic, we think that increasing climate risks justify action by governments to start to expand the set of tools that they use to address such risks. Governments and capital markets alike should be looking to ensure that, instead of becoming a reinforcing doom loop that adds vulnerability to the system, their relationship instead supports mitigation and adaptation and provides a source of resilience for the region.

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14. Regional trade systems

Interview with David Jacks

1. **Given that many climate disruptions are likely to be unprecedented, it's risky to draw on the history of trade to anticipate future trade impacts in a rapidly warming world. Nevertheless, are there lessons from the past that you think apply to the world of climate disruptions outlined in the 2035 scenario?**

I agree with the assessment that scanning the historical record on trade for potentially inexact parallels to the present day is problematic, as both circumstances and triggers have changed. At the same time, a little historical knowledge can go some way in defining potential trajectories for the future.

For one, the current state of global trade really only started to form from the mid-1980s. That's when you can first see a real change in the character and dimensions of world trade in the data. These phenomena came into full view by the 2000s with the rise of China. The principal drivers of this 'fragmentation of production' or the creation of 'global supply chains' were changes in IT affecting the cost and speed of communication and monitoring of production overseas. Accompanying these drivers in IT were very significant investments in exploiting economies of scale in worldwide maritime shipping (and, to a lesser extent, air freight).

On the one hand, as this process took decades to develop, we probably can't expect a major shift in global trade overnight as modern production processes are exceedingly complex and rely on a very long chain of intermediaries and suppliers (regardless of their location worldwide). On the other hand, there's nothing truly permanent in the current state of affairs.

The intensifying geopolitical tensions of the Trump years and the trade disruptions of the Covid-19 pandemic have both revealed some limitations arising from such a nearly global division of labour. We get a sense of why this is so by thinking about the problems facing us in 2021–22 in ports around the world in getting products out of China and onto factory floors and shelves in other parts of the world. So, a process of decoupling will take place over a number of years, barring a 'big push' from governments. In the next couple of years, we may see the latter in areas deemed critical to both national security and public health interests like pharmaceuticals, personal protective equipment and semiconductors.

Over the next five to 10 years, firms outside these areas will also be recalibrating plans. Shortening—and thereby duplicating—supply chains will address some of the already present geopolitical risks of fragmented production. These include the concentration of key input suppliers in a handful of countries and the reliance on at-times fragile transport linkages. This process will also partially address climatic risk arising from the disruption of goods production and distribution outlined in the 2035 scenario as well as government regulation and public calls for reducing the carbon footprint of international trade. For firms, it will be a question of identifying domestic or at least more regional sources of inputs and potentially replicating

production facilities in multiple theatres of the global economy (for example, China, the Indo-Pacific and North America).

In this way, global trade may more readily resemble the 1930s than the 2010s, with distinct regional trading blocs, but hopefully without all the attendant hostilities and suspicions underlying the interwar world order.

2. **Drawing on the 2035 scenario, can you paint a picture for us of the overall impacts on regional trade, including (as appropriate) with respect to:**
   - **the risks and consequences of disruptions to physical trade infrastructure**
   - **trade dimensions of the energy transformation from fossil fuels to renewables.**

Given the projection in my answer to the first question, it might not be surprising to see an intensification of Indo-Pacific trade, at least in relative terms. Potentially rising incomes in parts of the region like Sri Lanka and Vietnam as well as shortening/duplication of global supply chains all lean in this direction, even if global trade only manages to tread water or even decline in the years to 2035. Escalation of the lingering US–China trade war could also intensify this trend if we see further displacement of US-destined production away from China and towards places like the Philippines and Vietnam. This isn't to say there will be no dislocations and disruptions along the way.

One of the most critical nodes in regional trade are the ports. If changes in sea levels are as dramatic as in the 2035 scenario, we'll see an amplification of the disparity in fortunes across ports (and host countries) which are likely to occur anyway. Whereas we tend to view ports as static features of a local environment, inter-port competition and intra-port adaptation drive their long-term success, and only those ports which are able to tap deep pockets of capital survive. Rising sea levels will only serve to increase the capital requirements for staying in the game. Naturally, some of them may fold or at least wither on the vine.

In a similar manner, investment in intermodal connections at and to ports is important. With greater climatic disruption or even destruction of land-based rail and road connections, more investment dollars will be needed just to stand still. And with seaborne climate events disrupting coordination within ports, we're likely to see further consolidation and also-ran status in the industry in order to partially compensate for months-long outages as envisioned in the 2035 scenario.

But whereas trade may in fact intensify in the Indo-Pacific region (at least relatively), some trade imbalances external to the region will ease. If the projected decline in fossil-fuel consumption emerges, some of the world's largest oil importers (including China, India, Japan and South Korea) will see improvements in their current accounts, while oil exporters (none of which are in the Indo-Pacific region, narrowly defined) will see a corresponding deterioration. Given the accounting definitions underlying the current account, this would then serve to bolster the external capital positions of some countries in the region, perhaps cushioning the blow of some climate-related shocks.

3. **Will there be significant trade opportunities in this changing environment? Which countries, sectors, commodities, institutions—if any—stand to benefit in this future world and which will be hardest hit?**

As with so many other aspects of climate change, it stands to reason that those behind the game now will only find themselves further away in coming years from the leading edge of the global economy. Thus, areas like Bangladesh, the northeastern states of India, Indonesia and Myanmar, with their low levels of present-day economic development and institutional capacity, will likely be inundated, literally, under the 2035 scenario.

There is, however, one relatively neglected component of trade which could work in the favour of low-income countries which have also seen rapid rises in higher education, like Bangladesh. From the 1950s, trade in services increased from negligible amounts to roughly 10% of global trade in 1970 to roughly 25% in 2021. Given the relatively light carbon intensity of this trading activity and given further increases in computational speeds and reductions in computational costs, significant elements of the now non-traded sectors of the global economy could become traded in the near future.

But as much as this represents an opportunity for some countries, it could also represent a challenge for others, particularly rich, developed countries which are already struggling to maintain the ranks of their middle classes.

4. **Do you agree that food insecurity seems to be a particularly likely and harmful consequence of climate change? If so, can you share with us your thoughts on the trade dimensions of this issue and how they might unfold in a warming climate?**

I absolutely agree with this proposition and worry this isn't just a likely consequence, but almost a foregone conclusion in the present state of international policymaking. Apart from a professional interest in global trade, I am also a keen observer of global commodity markets. One curious feature of commodity markets has been the degree to which the food crisis of 2007 and early 2008 has been overshadowed by sorting through the causes and consequences of the global financial crisis (GFC). As a reminder, this food crisis was marked by exceptional shortfalls in production, widespread lack of access, and severe localised food insecurity. All told, the number of food-insecure people increased by roughly 100 million as the global food import bill rose to its highest level on record.

At the same time, the GFC and accompanying credit contraction hastened the decline in commodity prices, in particular those for grain. From May 2007 to April 2008, grain prices increased by 145%, while from May 2008 to April 2009, grain prices decreased by 40%. Thus, the round trip left prices a 'mere' 50% higher and left the food crisis only dimly imprinted in many people's minds. What's striking about this episode is how the standard story, which only looks at nominal prices, frames the problem in the wrong way. That is, while nominal prices increased by a factor of four from the levels of the early 2000s, the real price levels of 2007–08 weren't unprecedented in comparison to those over the previous decade. However, the rate of change was. In other words, the food crisis was a period of acute commodity price volatility.

I think that acute price volatility is one relatively neglected aspect of the literature surrounding climate change. We should set aside the first moment (the average of prices) and instead consider the second (the variance of prices). For every decade since the 1950s, there's been a widening distribution of standardised local temperature anomalies across continents—a trend that would presumably continue in the 2035 scenario. And this trend will interact with well-established (and negative) threshold effects in crop yields for grains which account for roughly two-thirds of the caloric requirements of humankind.

Cumulatively, this suggests greater volatility in not only temperatures but also in increasingly tight commodity markets. These impacts would be bad enough on their own, but they'll also likely be compounded by the natural response of domestic policymakers: they'll tweak trade policy in a hope to counteract the vagaries of global food markets by shutting down or restricting external trade (for former exporters) and cutting tariffs or subsidising purchases (for former importers). However, during the food crisis of 2007–08, grain export bans and tariff reductions cancelled each other out in their effects on quantities but exacerbated price changes. By one estimate, 45% of the change in global rice prices and 30% of the change in global wheat prices was due to the domestically insulating but uncoordinated behaviour of governments.

5. Based upon your thoughts on questions 1–4, what are the steps we should be taking today—multilaterally, regionally or nationally—to mitigate the negative trade consequences (apart from reducing greenhouse gases as rapidly as possible)?

As much as one could worry about other effects on trade, I think my answer to question 4 really points to the need to address food security via international policy coordination. In particular, international trade policy should be set to minimise the 'beggar thy neighbour' aspect of abrupt introductions of export bans and tariff reductions for foodstuffs. Having a more narrow frame of reference and scope of action seems more feasible than a scatter-shot approach to all things trade-related. Moreover, it's easy to rationalise this approach on humanitarian grounds, particularly if it's first pitched at a more regional level. One mechanism to consider in the context of ASEAN would be to bring discipline to export restrictions on grains for which no agreements are currently in place and which could serve as an alternative to the Special Safeguards Mechanism proposal during the Doha round of WTO negotiations. On the latter, it seems likely that in coming years the WTO will recede even further on the sidelines as the distributional consequences of climate change draw an even sharper line between the developed and developing countries of the world.

Part 5
Climate stress and regional institutions in 2035

15. The Pacific Islands Forum

Stephanie Lawson

As the premier regional organisation with an explicit political remit, the Pacific Islands Forum might be expected to take a robust lead on climate-change policy and to use its resources to engage proactively in global climate-change diplomacy, especially given that Pacific island countries (PICs) are among the world's most disaster-prone in terms of natural hazards such as cyclones, floods, tidal surges and tsunamis. From the mid-20th century through to 2010, PICs have experienced more than 200 disasters affecting 3.5 million people and costing more than US$6.5 billion.[1]

The numbers may seem small relative to larger countries, but the impact per head of population puts PICs at the top of the league table. Given that record, the increasing frequency and intensity of natural disasters suggest that the prospects for survival in a climate warmed to more than 1.5°C above pre-industrial levels are bleak. There's now a very real possibility of whole countries being submerged by rising sea levels, or at least being rendered uninhabitable—requiring the relocation of entire populations.

Given this scenario, it's little wonder that climate change and related security threats are now at the top of the regional agenda. A key question, however, is whether those regional institutions designed to enhance the collective security of the region in the face of anthropogenic climate change and related challenges are fit for purpose. In addressing this question, I look first at formal regional organisations in the region and developments in geopolitics and political economy. The roles of Australia and New Zealand are especially important in this context, but so, too, is the politics of subregionalism among the PICs, which has come about as a result of trends through which distinctive political identities, based on subregional groupings, have developed. All these developments affect the security outlook for 2035 and beyond.

Regional organisation in the Pacific

Regional organisation in the Pacific is multifaceted: two major institutions operate alongside a host of other agencies, civil society groups and subregional organisations.

The Pacific Islands Forum (hereafter "the forum") has long been regarded as the region's premier intergovernmental organisation. It has a broad remit, ranging from security and trade matters to good governance, economic growth and sustainable development. Its membership consists of independent and self-governing states and territories within the region, including Australia and New Zealand. The forum's secretariat, based in Suva, Fiji, also works to coordinate the principal regional agencies through the Council of Regional Organisations of the Pacific.

The forum was established in August 1971 as a summit for leaders of the newly independent and self-governing countries of the island Pacific, along with Australia and New Zealand.

Its establishment followed years of frustration with the South Pacific Commission (now the Pacific Community), which was the region's first substantive regional organisation. From the commission's foundation in 1947 by the region's colonial powers (Australia, New Zealand, the US, the UK, France and the Netherlands), it had prohibited discussion of any matter deemed 'political'. Such matters included security, trade, decolonisation and nuclear testing, discussion of which French colonial interests, in particular, viewed as subversive.

From its start, the forum was therefore politically attuned, although, for at least the first few decades, island members were concerned to avoid broaching domestic political matters.

The Pacific Community remains the largest regional organisation. Its 26 members include all the independent PICs and dependent or non-self-governing territories, plus most of the former and current colonial powers—the US, France, Australia and New Zealand. The Pacific Community's responsibilities extend to scientific and technical assistance and policy advice to all the PICs, regardless of their political status, in key areas such as fisheries, public health, geoscience, youth employment, food security, sustainable development, climate change and disaster risk management. It continues to eschew 'political' matters, insulating it from some of the tensions that the forum has experienced over the years, such as the fallout from Fiji's coups. However, while traditional security issues are formally excluded, human security concerns are high on its agenda, and coordination with other regional organisations and agencies remains the key to effective service delivery.

Forum membership over the years expanded to 18 to include all the independent and self-governing PICs as well as New Caledonia and French Polynesia, which were admitted to full membership in 2016 despite their status as French overseas territories. They are, however, self-governing in most respects. As an organisation with an explicit political remit, and a membership largely comprising fully sovereign states, the forum appears best placed to engage with a broad security agenda.

Most issues that the forum deals with are clearly about human and environmental security and are reflected in a recently formulated 'Blue Pacific' narrative and associated motifs such as 'blue–green economic growth',[2] but are still related to state security and broader geopolitical developments. Indeed, to portray human security and state security, along with strategic concerns, as essentially opposing paradigms is to miss important complementarities.[3] Thus, human security, state security and violence, and economic security—outlined in the 2035 scenario as the three principal dimensions of a comprehensive security approach—are inseparable.

Geopolitics and political economy

Enmeshed in contemporary geopolitics are political economy issues in which China is playing an ever-increasing role. The forum's members have generally welcomed Chinese aid as well as expanded market opportunities. However, much of the aid, while involving less stringent processes and accountability, let alone conformity with a 'good governance' agenda, comes

in the form of bilateral concessional loans from the Export–Import Bank of China (China Eximbank), which is a wholly state-owned and -controlled enterprise associated with Xi Jinping's Belt and Road Initiative.

Servicing debts accruing from infrastructure projects (anything from office buildings to sporting facilities) might not always support local, sustainable growth or enhance climate-change resilience. The ability of individual PICs to maintain adequate expenditure in other important areas—from health, education and countering gender violence to climate adaptation and mitigation (which, in turn, affects food and water security) may be compromised. Inability to service debts can also result in PICs losing control of financial or physical assets if those assets are used as security against debts incurred, although the secrecy in which debt contracts are typically shrouded limits the availability of evidence.[4]

These possibilities arise through bilateral arrangements, which fall outside the forum's remit and are often somewhat opaque because of confidentiality undertakings but clearly have broader regional implications. They also have implications for the region's 'traditional' donors—Australia, New Zealand, the US, France and the EU, among others—and play into the wider Indo-Pacific security framework. Various strategies of 'rebalancing', 'stepping up' and 'resetting' by the US, Australia, New Zealand and other countries, are now deployed to counter China's growing influence with PICs, whether or not those strategies are articulated specifically in those terms. Renewed attention on the part of those donors holds some promise for more effective policy responses to climate change, although the 2035 scenario suggests that those responses may prove to be too little, too late.

Still prominent in the policy approach of traditional donors is the 'good governance' agenda, which doesn't figure in China's approach to aid—something that's usually welcomed by recipients. However, the 2035 scenario is entirely realistic in identifying the extent to which ineffective responses to disasters—a sure consequence of poor governance and the further weakening of already fragile states, which include several forum members—will amplify public discontent over increasing inequality, entrenched corruption, lack of government services and weak institutions of governance, all of which lead to significant societal stress as climate-change impacts deepen.

Lack of state capacity in service delivery, which is a key prospect in the scenario, has been exacerbated by past policies supporting neoliberal structural reforms—pushed by Western donors—that sought to reduce public-sector activity and support private enterprise. Even in the absence of climate-change stressors, the Melanesian countries, in particular, already find it difficult to maintain stable polities, as a serious outbreak of rioting, looting and arson in Solomon Islands in November 2021 attests.

The forum's efforts to enhance good governance in the PICs must strengthen state capacity not just in law and order, electoral integrity and social-services delivery but in the protection of key natural resources (forests, agricultural land, water), including oceanic resources. The PICs' exclusive economic zones encompass vital industries, such as fisheries, that are critically endangered by warming. The private sector can't deal with concurrent, cascading climate change shocks, although it will be adversely affected by them.

Australia and New Zealand in forum politics

Australia's and New Zealand's membership of the forum is sometimes controversial. In addition to their history as colonial powers in the region, they're both major donors, and Australia, especially, is often depicted as exerting undue pressure on forum members to conform to its own agenda. However, a detailed review of the forum in 2013, led by former Prime Minister of Papua New Guinea Mekere Morauta, didn't support that view of 'hegemonic regionalism', stating that there was 'little or no evidence of Machiavellian donor influence on the agenda'.[5]

That said, Australia has come in for much legitimate criticism about its climate-change policies, especially its continuation of high-carbon energy production for domestic consumption as well as its coal and gas exports. The refusal of conservative Australian governments to date to limit such production, and indeed to support it, even as private-sector investment in renewables and disinvestment in carbon-based energy production surges, has had significant implications for Canberra's approach to forum policy. Indeed, the forum's formal responses to global policy initiatives have been compromised by Australia's intransigence, leaving PICs to sometimes go it alone in global climate diplomacy. Criticism of New Zealand has centred on its relatively high-carbon agricultural industries.

At the same time, and somewhat ironically, Australia and New Zealand continue to deliver very significant aid to strengthen climate adaptation and mitigation measures in the Pacific island region and to respond generously after natural disasters. In the final analysis, however, the costs of such disasters are borne by Pacific islanders on the ground, or what may be left of it.

The capacity of the forum to respond to crises has been tested over the years. Fiji's membership was suspended from 2009 until the restoration of democratic processes in 2016, during which period Fiji's coup leader, Frank Bainimarama, established the Pacific Islands Development Forum (PIDF) in an attempt to bypass the forum. Unsurprisingly, Australia and New Zealand were excluded from membership. Bainimarama had blamed Australia and New Zealand for Fiji's suspension from the Pacific Islands Forum, although all other forum members had evidently reached a consensus on the issue.

While attracting some support, especially given its focus on environmentally sensitive 'green/blue growth', the PIDF scarcely compromised the forum's status as the premier regional institution, and it continued with a business-as-usual approach. In 2021, however, all six Micronesian countries indicated their intention to withdraw from the forum following fallout over the process of appointment for a new secretary-general, reducing the forum's membership to 12.

This clearly has major implications for multilateral cooperation via the forum and for its ability to coordinate the concerns of PICs on the entire range of issues that it manages. The fallout has come about as a result of trends in subregional politics through which distinctive political identities have developed. This has exacerbated regional institutional fragility and patchwork arrangements that make it more difficult to coordinate on advocacy as well as disaster responses.

Subregionalism

Important subregional organisations have emerged in recent years, based on the tripartite division of the island Pacific into Melanesia, Micronesia and Polynesia—a division arising from assumptions by early European explorers concerning the cultural and 'racial' characteristics of each group. Although roundly criticised by some (mainly academic) commentators in more recent times, island leaders in the various groups have invested in this division as expressed through the Melanesian Spearhead Group, the Polynesian Leaders' Group and the Micronesian Chief Executives' Summit, which operates alongside the Micronesian Presidents' Summit. The development of political identities in accord with the Melanesia/Polynesia/Micronesia division has given rise to the rivalries within the forum that have precipitated the split away by Micronesian members.

One other subregional group of note, albeit one formed within the forum rather than outside it and not based on cultural affiliations, is the Smaller Island States (SIS) group consisting of the Cook Islands, the Federated States of Micronesia, Kiribati, Nauru, Niue, Palau, the Republic of the Marshall Islands and Tuvalu. Although transcending the tripartite division, the group's membership is largely Micronesian. As the name suggests, the members have very small land areas. Most are also very low lying.

The SIS group was established in 1990–91 to focus on the particular challenges its members faced in vulnerability, sustainability and resilience, although it took until 2006 to establish a SIS program unit within the forum's secretariat and another 10 years for the adoption of a formal regional strategy for the SIS group. The strategy was designed to ensure that the special interests of the SIS group in climate change, health, marine resources and transport maintained a high profile in regional planning and policy implementation.[6]

Given the current situation with the forum's Micronesian membership, prospects for the SIS group in terms of coordinating policy, planning and programs to address climate-related developments, to which the SIS members are clearly the most vulnerable, is compromised at least as far as forum action is concerned. Even so, a Pacific Small Island Developing States group has emerged as a coalition bloc in global climate change advocacy and is active at the UN. It offers another means by which climate-change diplomacy can be pursued, as do other groupings such as the Coalition of Atoll Nations on the issue of Climate Change and the Alliance of Small Island States.[7]

The security outlook

The 2013 forum review proposed that an earlier Pacific Plan for Strengthening Regional Cooperation and Integration, adopted in 2005, be recast as a new Framework for Pacific Regionalism and that, among other things, it should take more account of important subregional differences, including those of the SIS group. The new framework was formally endorsed in 2014, accompanied by a forum leaders' statement reiterating the challenges facing PICs in terms of 'complex vulnerabilities, dependencies, and uncertainties that arise for

countries and communities as our region changes with modernity, the processes of globalisation, and the damaging effects of climate change'.[8] The framework sets out objectives similar to those of the 2005 plan: sustainable development, inclusive economic growth, strengthened governance, and security to ensure 'stable and safe human, environmental and political conditions'. Not surprisingly, policies addressing climate-change vulnerabilities have been prominent.

The forum's 2018 Boe Declaration on Regional Security also placed particular emphasis on the Blue Pacific narrative, encompassing environmental issues and climate change in particular and reaffirming that 'climate change remains the single greatest threat to the livelihoods, security and wellbeing of the peoples of the Pacific and our commitment to progress the implementation of the Paris Agreement'.[9] It's noteworthy that Australia and New Zealand were party to that statement, although Australia, at least, has been reluctant to address the impact of its own fossil-fuel industries.

Conclusion

The forum's ability to address the challenges presented by the 2035 scenario has been weakened substantially by conservative Australian approaches to climate policy, both domestically and globally, as well as by subregional rivalries among its Pacific island members. New Zealand, under the Ardern government, appears better placed to push a more progressive line, but the goodwill that Australia has generated in the past through aid and other programs is likely to diminish, given its relatively weak domestic emissions-reduction targets, which leaves it incapable of playing a leading, unifying role in global climate-change policy. Also, given the large number of Pacific islanders already resident in Australia and New Zealand, and the fact that they're both forum members, it's likely that many climate-change refugees from the island Pacific will look to them for resettlement in the event that their own countries become increasingly uninhabitable.

As Pacific Community members with a longstanding presence in the region, the US and France will also have a major role to play. Coordination through both major regional organisations and other relevant agencies, especially through the Council of Regional Organisations of the Pacific, will therefore be essential for effective policy responses. Those responses could include a means by which some form of sovereignty might still be exercised by PICs whose territories have been rendered uninhabitable.

The prospect of increasing great-power strategic competition and its unsettling effects on the Pacific's vulnerable island states also play into the 2035 scenario, in which more, rather than less, effective multilateralism is essential to meet the challenges. That can only be achieved by a much more united effort from the forum's members. And, while Micronesian countries—the most vulnerable to climate-change impacts—may well be aggrieved by the failure to secure their favoured nominee as secretary-general, their withdrawal from the forum over that issue comes at a time when their very existence is at stake and effective multilateral action is more important than ever.

China's role in climate-change policy is also noteworthy. While it's the world's largest greenhouse gas emitter, it has at least 'talked (some of) the talk' on the importance of the issue for PICs and delivered assistance in climate-change-related infrastructure and capacity building, although that aid remains marginal compared with aid from other major players, such as Australia, the EU and the Green Climate Fund.[10]

If the 2035 scenario is to be mitigated, all PICs, along with Australia, New Zealand and other major donors, including China, must adjust their strategies and look to coordinate efforts on more ambitious schemes, including possible large-scale infrastructure projects to raise areas of land threatened with submergence. Again, the forum has the potential to play the key coordinating role, but only if its individual members and major donors are all willing to adapt their existing approaches in a collective effort to confront the scenario.

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16. ASEAN

Sharon Seah

Introduction

Globally, non-traditional security problems now overshadow traditional security issues.[1] The Covid-19 pandemic is an example of a non-traditional issue that has and will continue to profoundly affect global politics, economies and the societal wellbeing of countries for years to come.[2] Although early Covid-19 reactions led to border closures and trade restrictions, ASEAN worked to keep supply chains open and supported its members to cautiously reopen their borders as countries realised how interdependent they were. As an institution, ASEAN has found it difficult to keep up with the smorgasbord of non-traditional challenges such as extremism, terrorism, cybersecurity threats, natural disasters, climate change and transnational crime. The growing significance of such challenges has facilitated intra-ASEAN cooperation, rather than competition, as seen in the proliferation of working groups in a number of sectoral bodies. However, part of ASEAN's inability to address non-traditional security issues effectively relates to the way issues are framed in its siloed three-pillar (political–security, economic and socio-cultural cooperation) governance framework when many of those issues are cross-cutting.

In a recent survey, climate change emerged as among the top three regional security challenges in Southeast Asia.[3] That result was corroborated by another survey of seven Southeast Asian countries and Fijian policy elites, which found that climate change and other non-traditional threats were of greater concern than traditional military problems.[4] In a separate 2021 regional climate survey, a majority of Southeast Asians surveyed responded that climate change poses a serious and immediate threat to the wellbeing of their countries: 46% said that their governments were aware of the threats posed by climate change but hadn't allocated sufficient resources to address the threat.[5]

Southeast Asia's strategic, political and ecological environments are complex. Far from being homogeneous, ASEAN's 10 countries possess different political orientations, ranging from an absolute monarchy to military dictatorships, and are at different stages of development. Myriad ethnicities, languages, cultures and religions co-exist in Southeast Asia. It's an area of great biodiversity but also the most deforested region in the world, surpassing even Latin America and Africa. Southeast Asia must survive in a rapidly evolving geostrategic atmosphere of intensifying rivalry between the US and China, which is reflected in a growing number of flashpoints, including the South China Sea, the Taiwan Strait and the Korean Peninsula. When a threat multiplier such as climate change is thrown into the mix, the risks are amplified.

Half of the world's top carbon emitters are countries in the Indo-Pacific: China (26.1%), the US (12.67%), India (7.08%), Japan (2.5%) and Indonesia (2.03%). Together, they contributed 50.38% of global total carbon emissions in 2018.[6] According to World Bank data (2018), ASEAN

contributes only 5.6% of global greenhouse gas emissions with Indonesia making up almost half of that share.[7] The International Energy Agency has estimated that, while there was a 5.8% decline in global emissions in 2020, a 4.8% rebound and growth is projected in 2021.[8] The strongest rebound in emissions will come from developing economies: China and India.

As of October 2021, all 10 ASEAN member states had submitted their updated nationally determined contributions (NDCs). Singapore was the first ASEAN country to voluntarily submit a long-term low emissions development strategy, followed by Indonesia and Thailand.[9] In September 2021, Malaysia announced a 2050 carbon neutrality target, making it the most ambitious Southeast Asian country, but it has yet to submit detailed plans showing how it intends to achieve that target. Although some ASEAN countries joined the growing momentum of several high-level political pledges at COP26, it remains to be seen whether and when there will be serious implementation of those pledges in the region.[10] Overall, the assessment is that the current slate of ASEAN NDCs and national climate policies are woefully inadequate for the task of significantly reducing greenhouse gases.[11] ASEAN's efforts towards curbing emissions, of course, will be a drop in the bucket compared to the actions of top emitters in the Indo-Pacific, such as China, the US and India, although economies such as Indonesia's, including its energy-system choices, are nevertheless globally significant.

ASEAN in a warming climate

Considering the NDCs submitted in connection with COP26, current estimates suggest that in the best case the world is headed for a 1.8°C temperature increase, but only if all NDCs and pledges are fully and promptly implemented.[12] A 2.4°C or higher temperature increase could happen in a worst case scenario. The IPCC's 6th assessment report, released in August 2021, identified several impacts on Southeast Asia. Aside from temperature increases, the region will experience an increase in rainfall, higher flood levels, prolonged inundation in the Mekong delta and extreme cyclones, although how those impacts emerge will vary substantially across the region.[13] At the national and subregional levels, climate impacts are likely to act as multipliers of existing threats to human security and ecological and environmental assets and as potential new drivers of instability in the region.

The 2035 warming scenario outlined in this volume for the Indo-Pacific region is consistent with IPCC findings: without drastic reductions in the region's current rate of emissions, we'll reach 1.5°C of additional warming between 2030 and 2052.[14]

According to a study by the Swiss Re Institute, an increase of 3.2°C could cause a 37% reduction in GDP for ASEAN economies, relative to a world without climate change. Conversely, if the temperature increase is kept to well below 2°C, the loss would be only 4.2%. That study suggests that the ASEAN region has much to lose if it and the wider world fail to limit warming.[15] The degree to which climate change causes instability in ASEAN and the Indo-Pacific depends fundamentally on how deeply and rapidly global emissions are reduced,[16] and particularly on avoiding environmental tipping points.[17]

It's difficult to speculate about how the various disruptions outlined in the 2035 scenario will affect ASEAN and its individual members. Climate change comprises both rapid-onset events, such as typhoons, cyclones and landslides, and slow-onset events, such as drought, floods and vector-borne diseases. The history of disaster risk-reduction efforts suggests that ambitious climate action is most likely in the aftermath of exceptional climate catastrophes.

Given what we understand about ASEAN regionalism, its history and institutional processes, ASEAN's decision-makers are unlikely to move from a business-as-usual pathway without the trigger of a large-scale, multi-hazard disaster or the emergence of an ASEAN member that is a strong climate champion. Because of ASEAN's consensus approach to decision-making, a complete transformation in the region's response to climate change will require a group of like-minded leaders to emerge from among the 10 member countries, reinforced by increasing public focus on climate threats and disasters.

Large-scale regional disasters are certainly likely in a warming climate. The *ASEAN risk monitor and disaster management review* (ARMOR) measures each member state's disaster risk, including its multi-hazard exposure, vulnerability and coping capacity. The 2020 ARMOR report found that the Philippines, Indonesia and Myanmar had the highest multi-hazard exposure (which includes both climate-related and geological hazards), while Singapore ranked the lowest.[18] Vietnam's risk exposure to floods is the highest in the region and can, similarly, drive migration out of the delta region. The mass displacement of populations can contribute to social disruption, including, if those populations cross borders, to intra-ASEAN tensions and even conflict. Those climate impacts are likely to be magnified in regions with deep-seated ethnic, religious, cultural and political divisions.

The ARMOR report ranked Myanmar, the Philippines and Laos highest on the vulnerability index because of their limited resources to adequately prepare for, respond to and recover from disasters.[19] Myanmar, Cambodia and Laos were ranked as having the most limited capacities to cope with hazards (the quality of infrastructure being a key factor for the lack of response capabilities), whereas Singapore, Brunei and Malaysia were deemed to have the best coping capacities due to their robust governance, economic and infrastructural capacities.[20]

Within this context, Singapore, Brunei and perhaps Malaysia may be best placed to emerge as like-minded climate champions. Singapore is serious about its climate commitments. Its government has taken pains to explain climate change's existential threat to the country, outline the city-state's vulnerabilities and its climate plans to its people.[21] Singapore's parliament declared climate change a 'global emergency' in February 2021, signalling its seriousness in addressing climate change.[22] Although initially slow in its climate planning, Brunei released a new national climate policy paper in 2020 outlining its priorities and plans for adaptation and mitigation.[23] Brunei, as the chair of ASEAN in 2021, made climate change its priority and delivered several regional initiatives, including the establishment of an intergovernmental climate centre.[24] Meanwhile, Malaysia's plans to achieve net-zero status by 2050 through a combination of no new coal plants and the use of carbon pricing instruments could position it as a consensus-builder.

ASEAN's institutional limitations

A recent survey by the Center for Strategic and International Studies suggests that regional elites generally believe that ASEAN is the best placed institution to address the region's challenges.[25] However, a study by the ISEAS – Yusof Ishak Institute found that ASEAN's current climate governance structure doesn't equip the organisation to meet climate challenges effectively.[26] ASEAN climate issues are discussed in at least 13 sectoral bodies, cutting across thematic areas such as agriculture, forestry, fisheries, food security, air pollution, marine pollution, sustainable development, transportation and smart cities. Cooperation also takes place through such ASEAN mechanisms as the ASEAN Regional Forum, the East Asia Summit, ASEAN Plus One, ASEAN Plus Three and ASEAN Defence Ministers Meeting. The study highlighted several limitations, including the inability of the organisation to look at cross-cutting issues holistically, the absence of a central reporting structure that cuts across ASEAN's three pillars of cooperation, and the need to cut duplication and replication of focus.[27]

Aside from ASEAN's own institutional limitations, the threat multipliers of climate change—such as water scarcity, population displacement, forced migration and rising sea levels altering maritime boundaries—are profound challenges that international governance systems have yet to address comprehensively. The UN Convention Relating to the Status of Refugees lacks a definition of 'climate refugee', the world lacks an international water governance treaty, and the impact of sea-level rise on maritime boundaries under the UN Convention on the Law of the Sea hasn't been adequately considered.[28] Some international bodies, such as the International Law Commission, have started working on the challenges of climate change, sea-level rise and maritime boundaries, but others haven't even begun a discussion.[29]

ASEAN's ability to act collectively is curtailed by its own institutional limitations and the absence of a robust regional framework. This is where ASEAN's cooperative mechanisms, such as the ASEAN Defence Ministers' Meeting Plus (ADMM Plus), which involves key dialogue partners of ASEAN, can be helpful in rising to the challenge of meeting climate crises. A report of the International Military Council on Climate and Security has recommended that the ADMM Plus add climate change to the agenda of its Expert Working Group.[30] By incorporating climate change, the grouping can start to coordinate and share information on functional responses. One crucial area is humanitarian assistance and disaster response (HADR), which has, over the past decade or more, become an emerging area of concern as militaries are called upon ever more frequently as first responders to large-scale humanitarian disasters caused by climate change.

Outside of ASEAN's cooperative mechanisms, existing military arrangements such as the Five Power Defence Arrangements (FPDA) between the UK, Australia, New Zealand, Malaysia and Singapore and the new minilateral frameworks have proven more nimble and rapid-acting. As early as 2003, the FPDA partners decided to include HADR elements in their exercises.[31] For the foreseeable future, as climate security becomes more of a concern, militaries incorporating interoperability for crisis management and disaster response are likely to be increasingly called upon to manage multiple climate crises. Similarly, the Quadrilateral Security Dialogue (the US, Japan, India and Australia) has already committed to cooperating in areas

such as vaccine security and climate change. Improving the interoperability of the Quad navies in HADR activities may be a fruitful move for further cooperation, particularly for India's desire to strengthen its regional security role.[32]

Concluding observations

ASEAN now needs to conceive of climate change as a critical component of regional security and proactively manage the range of climate-induced challenges, including conflict, that may emerge. The region's disaster risk exposure will be exacerbated by the frequency, severity and geographical scale of extreme weather events.

ASEAN is likely to play an increasingly important role in convening and coordinating regional militaries involved in disaster response and preparedness. Ensuring that civil–military and local–national coordination takes place will be especially critical. In this respect, it's encouraging that the Philippine and Vietnamese armies have begun cooperating to enhance HADR capabilities.[33] ASEAN needs to better access global climate-change projections and modelling that are downscaled to the regional level to inform planning for the threats ahead.[34] It also needs to build an integrated knowledge-management system to measure climate impacts and disaster risk for humanitarian operations.[35]

Immediate disaster response is only one part of the climate equation. ASEAN has an important role to play in long-term climate preparations and responses, despite prevailing views that it's becoming increasingly marginalised by a proliferation of new security arrangements, such as the Quad and AUKUS. This will require ASEAN to engage on climate change more actively with the US, India and China, all of which are members of the ASEAN Regional Forum, ADMM Plus and the East Asia Summit. Engaging those key players and influencing the alignment of their climate policies to reflect the interests of the ASEAN region will be the key not only to accessing essential financial, technical and capacity-building support, but also to promoting regional peace and prosperity.

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17. The Asian Development Bank

Richard Moore

Introduction

With the hindsight we have now in 2035, it's clear that the previous decade's events and climate change almost broke the Asian Development Bank (ADB). Fortunately, the stepping up of regional powers, the development of new partnerships and some controversial innovations in international governance made the bank's role more important than ever.

As a major multilateral financer, ADB progressively stepped up its climate-change focus in the second decade of the 21st century, tentatively at first, often in response to shareholder pressure, and then rapidly as developing country member needs and priorities shifted.

Despite that, by 2020, less than 80% of the US$100 billion annual climate-change finance promised by wealthy nations to assist developing countries a decade earlier at the Copenhagen climate change conference was in place.[1] That figure itself was to prove quite inadequate for what was to come, as the shortfall and over-reliance on public funds forced major change.

Evolution of ADB's climate-change approach

ADB's 2009 climate change policy was a watershed that subsequently saw no further support for coal-powered energy generation after 2013, much to the chagrin of Australia. A 2015 commitment to lend US$6 billion per annum for climate-related activities,[2] doubling its climate change financing, helped drive serious change, including through the creation of the Climate Change and Disaster Risk Management Division.

ADB entered the third decade of the 21st century with its balance sheet strengthened through a merging of separate resource pools and a strong commitment to mainstream climate change into all its operations. Overall, ADB operations doubled to more than US$30 billion in the years 2016 to 2020,[3] with half of that growth attributable to a very large response to the Covid-19 pandemic. The bank's total assets likewise grew to nearly US$300 billion.[4] The challenges were many in the Asia–Pacific region, but the bank looked well placed to meet them.

Even the Covid-19 pandemic, while lasting longer than many expected, especially in its economic and educational impacts, didn't derail ADB's climate change policy. Covid-19 did, however, contribute to the bank's 'scissors crisis'—the escalating demand for climate finance from developing country members and its declining availability. This resourcing crunch intensified throughout the 2020s.

The disaster decade

Between 2025 and 2029, no fewer than five super-typhoons hit major population centres in the Asia–Pacific (Manila, Yangon, Dhaka, Guangzhou and Suva), with a cumulative death toll close to 1 million people and a damage bill that topped US$65 billion.

While typhoons had been a long-term Pacific phenomenon and increased storm activity had been expected, the impact of so many destructive superstorms in a short period was a real-time stress test that the ADB could meet only by running down its reserves. The superstorm crisis came on the back of what had become regular inundations of Bangkok, Ho Chi Minh City and Jakarta.

ADB had always been at its best in a crisis, adopting streamlined emergency procedures, pivoting programs to meet new needs, winning additional resources and moving with a speed impossible in normal times. However, by the time Dhaka was deluged by super-typhoon Kim in 2028, at a time of severe floods in the Mekong, the bank's emergency resources were already more than fully committed. In 2020, ADB's US$45 billion in reserves looked excessive, but before the end of the decade they were gone.

Slower growth, rising debt and destabilisation

Decelerating growth, as well as disasters, constrained the bank throughout the 2020s. ADB's revenues fell and its resourcing needs increased after Covid, as regional growth decreased from over 6% to little more than 3% in the 2025–35 decade.

The slow, first-stage Covid-19 vaccine rollout for developing countries was at last in its final phase in early 2023 when the resistant 'Iota' variant threatened a return to first base. Iota incubated in Papua New Guinea, spread to Australia and Indonesia and then to Hong Kong and globally. Although it was eventually conquered by the fast rollout of new mRNA vaccines, many Asia–Pacific developing economies were still at pre-2019 levels of GDP, five years after the initial crisis ended in the West. More countries qualified for concessional lending as a result, but there was less to go round.

Making matters worse, the trade-based growth model that had powered East Asia for decades faltered. Covid-19 turned countries inward. Supply-chain nationalism and 'strategic industry protection' just became growth-sapping protectionism. Reshoring meant more capital stayed at home.

Accelerating these damaging international trends, the 2024 Taiwan blockade hastened widespread 'decoupling' and geopolitical contestation, disrupting the global supply of computer processors for more than a year. Thankfully, the stand-off didn't result in outright conflict. The sudden and unexplained disappearance of President Xi Jinping momentarily raised tensions, but they dissipated as the collective Chinese leadership reasserted itself. Despite this welcome geopolitical development, China's economic restructuring continued apace, reducing its reliance on housing and infrastructure construction. That greatly increased international headwinds, especially for the erstwhile mining giant, Australia.

Heavy debt burdens, which had been building quietly, accumulated rapidly after the Covid-19 pandemic and became a major drag on growth, even though interest rates remained relatively low. Countries' capacity to borrow, at least from conventional sources, was increasingly constrained. Many turned to new and less transparent sources of finance, from opaque institutions in the Middle East, Central Asia and China, and few of the resulting financial obligations showed up in national budgets. Growing pressure on countries' finances caused several to fall into arrears in their ADB loan repayments. Some countries, it turned out, were swimming naked, and faced a long walk to the car park.

A major debt renegotiation process in 2028, led by multilateral development banks (MDBs), helped avert global financial contagion, but countries with the heaviest exposure to non-traditional financiers were unable to obtain the benefit. As a result, there were several sovereign defaults in Asia and the Pacific that further depressed regional growth in what had been the engine room of the world economy.

Consequently, ADB's revenues from loan repayments fell 54% from their 2023 peak, only surpassing that volume again in 2031. That limited its capacity to initiate new loans and forced talk of a general capital increase that wasn't agreed to because of political divisions between major stakeholders.

Sudden shift from mitigation to adaptation

While revenues and reserves were under pressure, demand for climate finance was not only growing, but also shifting strongly from mitigation to adaptation. ADB's 2015 $6 billion climate change finance commitment, notionally split between $4 billion for mitigation and $2 billion for adaptation, was suddenly inverted.

The logic of lending to large, fast-growing greenhouse gas emitters to accelerate the shift to cleaner power, finance mass public transport systems and promote much greater urban energy efficiency and rural water efficiency remained, but the need for adaptation to deal with immediate problems pushed mitigation efforts into second place. Mitigation was yesterday's problem, but everyone knew it was tomorrow's problem too.

Pacific countries sought more help in protecting freshwater supplies, managing depleted fish stocks and building sea walls, including mangrove 'green walls'. Mekong countries rushed to further retrofit existing buildings to protect them from floods. Indonesia and Malaysia sought emergency loans for agricultural assistance programs and land-use transformation in the wake of failing rains and crops. With 60% of the region employed in agriculture, forestry and fisheries, those sectors required major assistance, not least to avoid social unrest.

All across mainland South and Southeast Asia the great rivers fed by the snows and glacial lakes of Tibet first surged and then dwindled, exposing hundreds of millions to water and food insecurity. This was a leading contributor to the food crisis of 2032 that led to the overthrow of several governments in South and Central Asia and their replacement with unstable coalitions,

disinclined to compromise with their neighbours and inexperienced in both policymaking and negotiations. Fragility was now regional and global.

Shock US withdrawal

A growing sense of problems outpacing solutions was exacerbated by the 2027 decision of the second Trump presidency not to contribute to the replenishment of the Asian Development Fund. Under President Trump's 'No more Mr Nice Guy' policy, the President declared the Asian Development Bank an anti-US institution that for 60 years had stolen American jobs. In the political brawl that followed, the President denounced climate change as 'a Manchurian plot' and announced plans for the US to leave the bank altogether.

The shock of that announcement was the jolt the international system needed for deep reform, not least because, in the maelstrom that followed, ADB temporarily lost its triple A credit rating, undercutting its whole business model of raising long-tenured funds cheaply and sharing the benefits with its members. Ultimately, the solution came from what had been an undervalued part of ADB: private-sector operations.

The slow–slow–fast growth of private finance

The scale of ADB's private operations increased only modestly in the first half of the 2020s. While it consistently achieved the modest $1 billion target it had set for support of privately funded climate initiatives, private-sector operations remained under the bank's 33% target for total operations. In addition, notwithstanding some diversification, private-sector operations by volume remained heavily concentrated in a handful of large, better-off developing countries. To generate a lot more climate finance and coax it into a wider range of countries, major policy changes were necessary, but initially there was little appetite for them.

While the pool of available global capital, domestic and international, was largely private, investment in infrastructure was predominantly public—90% so in the case of transport infrastructure. The finance needed for expansion and climate proofing couldn't come from public resources and, while MDBs could help with money, knowledge and technical expertise, in 2020 they financed less than 10% of developing country infrastructure, outside of China and India. They didn't have the capacity to do directly what was needed; nor did their members.

This was a major challenge. In 2019, the Intergovernmental Panel on Climate Change had estimated the annual global costs for energy system reform, renovation and replacement at US$2.4 trillion a year.[5] Two years earlier, ADB had estimated that US$1.7 trillion a year would be needed for infrastructure renewal in developing Asia[6]—double its previous estimate, principally due to better understood and escalating climate-change impacts.

ADB's conclusion was that the private sector would need to quadruple its investments by 2020, but foreign direct investment had trended down as a percentage of GDP in low-income countries after the global financial crisis of 2007–2009 and fell again substantially after the pandemic.

With the public and private sectors each supplying about half of global climate finance but 80% of that money staying at home, there was an increasing gap between where resources were most needed and where they went.

The task became clearer and was twofold:

- Support domestic capital formation in developing countries through financial sector reform to grow the private sector's access to finance and attract more of that pool into climate-positive investments.
- Win developing countries a greater share of global capital and increase the proportion going to climate-change mitigation and adaptation, especially in areas such as transport and energy efficiency, water and food production.

Neither could happen unless there were a concerted effort to address sovereign risk through policy reforms. In addition, innovative structured finance was required to protect investors, and new insurance instruments and guarantees were needed, as was extensive use of blended, concessional and non-concessional resources to leverage money into low-income countries.

All of those instruments were already available, but for many years development financing institutions (DFIs) prioritised their own lending when other tools were clearly more effective. As the Centre for Global Development noted, guarantees generated nearly half of private finance for low-income countries in 2019[7] but didn't feature strongly in DFI portfolios, and blended finance accounted for less than 10% of their lending. Big reform was needed.

Eventually a new deal was struck, built on a fiercely contested UN analysis of international lessons learned from several decades of public–private partnerships (PPPs). The resultant policy changes strengthened both the public and private parts of the process. Regional oversight and benchmarking of national investment environments encouraged more policy predictability and greater protection of property rights. The private sector, for its part, was required to increase public transparency, including of pricing and risk allocation. International funding helped address negotiating imbalances, built local analytical capacity and supported regulatory and price-setting institutions. These changes increased the demand for—and supply of—PPP finance in developing countries and were accompanied by an MDB compact to prioritise the development of local and regional capital markets.

The agreement was ultimately dubbed the *New Generation Public Private Partnerships Framework* in recognition of the role that private finance subsequently played in moving beyond renewable energy generation in OECD countries and increasingly into energy transformation globally, but the path wasn't smooth.

A new chessboard

The American withdrawal from ADB looked as though it would permanently hobble the bank, weakening its capital base and making it a smaller, less powerful institution. A series of emergency ministerial meetings led to proposals from both regional and non-regional members to lift their shareholdings.

A Chinese bid to acquire an additional 5% stake, nearly doubling its shareholding, was vetoed by a range of major shareholders, resulting in the PRC's withdrawal from negotiations. India's proposal to move past the PRC into number two position caused the PRC to threaten to follow the US exit, in a rare expression of Sino-American solidarity.

Following the China–India stalemate, leading ASEAN nations were emboldened to propose lifting their shareholdings equally by 50%, maintaining parity between them. That took the share of the group from around 12% of the previous total to close to 20%.

While this was a highly consequential development, it was overshadowed by another, perhaps even more so. The lift in the ASEAN shareholding still left a notional 10% capital gap. The EU, Japan, Australia and Korea argued about the merits and demerits of trying to fill the gap. As they squabbled, a consortium of some of the biggest US businesses put forward a radical plan to guarantee the callable capital the US Government was withdrawing, until such time as the US formally rejoined the bank. Furthermore, they promised to increase private lending tenfold over a decade to achieve a clean energy finance revolution.

The consortium argued that it would bring both capital and business acumen to the ADB, helping it to achieve stronger financial results, innovate new products and achieve much greater private-sector operations. The ensuing deal was applauded by some as a breakthrough and condemned by others as a sellout.

A radical plan for two banks

A private-sector share-holding consortium was proposed as a constituency on the ADB board in what had been exclusively a club of nations, but that was unacceptable. As a compromise, it was proposed that the group be allowed observer status on the board with speaking, but not voting, rights along with managerial responsibility for ADB's private-sector operations.

That in itself represented a seismic shift. It was vehemently opposed by some countries, both authoritarian and liberal, regional and non-regional, who saw it as weakening nation-states. However, a clear, if somewhat grudging majority voted in favour of the measure, judging it to be the only viable option to simultaneously address climate mitigation and adaptation while also allowing for other pressing problems to be dealt with. The private-sector consortium's winning argument, which appealed to both developing and developed countries, was that it would power up Asia and green it at the same time.

Thus, a two-bank structure came into being, with ADB's 2020 Singapore office expanding into 'ADB Private'. By 2035, it had achieved the promised tenfold increase in ADB's private-sector operations. Its venture capital arm was a major driver of the hydrogen revolution that began to take off in the late 2020s. Of course, its total financing was still a fraction of what was needed, but, like ADB's public-sector operations, its big contribution was catalytic. In demonstrating that sovereign risk was more manageable in many countries than global financiers and OECD governments had assessed, it helped unlock much larger flows of international capital.

In particular, a growing share of the US$8 trillion in sovereign wealth funds in 2020 migrated to higher returns available in clean energy financing and infrastructure development in Asia.

ADB Private was also a major facilitator of Australia's 'Top End' renewable energy exports, first to Indonesia and then also to mainland Southeast Asia. ADB Private financed the Asian capital costs and helped broker the international consortium that supplied finance at the Australian end. The interlocking deals helped convert Australia into a renewables superpower while decreasing ASEAN reliance on fossil fuels, neatly complementing World Bank lending for Australia's Snowy Mountains hydro scheme in the 1960s. Green growth was thus boosted both in Australia and Southeast Asia, more strongly linking the two. This was the turning point in the restoration of regional prosperity.

Part of this success was the acceptance by the now non-resident ADB board of a much higher level of risk. The focus shifted from loss minimisation to operational maximisation and delivery of the greatest possible development results for members.

The rise of regional members

While private lending, especially for climate projects, expanded considerably, public-sector operations remained constrained. Here too, big reforms were forced. ADB formed deeper and more formal links with regional organisations such as ASEAN, the South Asian Association for Regional Cooperation, the Central Asia Regional Economic Cooperation Program and the Pacific Islands Forum. As a result, those organisations became more influential in its decision-making and the ADB in turn was able to empower and enable the regional bodies to service their members and to be more active and influential. The net result was the beginning of a period of steady growth in the provision of much-needed regional public goods, especially health security, biodiversity restoration, coordinated economic policy and the regulation and management of regional labour markets.

In this environment, former Indonesian Finance Minister and World Bank Vice President Sri Mulyani became the first non-Japanese—and first female—ADB president in 2030. The nomination process, for so long an election with only one candidate, was thrown open—and into chaos—when Tuvalu nominated its former Prime Minister to draw global attention to its climate change plight.

Subsequently, Indonesia announced its candidate, whose nomination was initially regarded by Japan as an affront. However, reading the room, Tokyo stepped aside to ensure a smooth transition and was praised for its magnanimity. This strongly signalled a new order: a rules-based system with the rules renegotiated. It was emblematic of the shift of power both to and within the Asian region.

A new 'sustainable societies' policy agenda

The consequence of these changes in the early 2030s was a rewriting of the orthodoxies of the preceding 30 to 40 years. Rather than starting from the Washington Consensus (1989) of pursuing small states and low taxation, ADB policy was increasingly framed around a Manila Consensus. Initially disparaged by many, it represented a significantly Asian slant on development policy. The organising principle was greater pragmatism in the means adopted to achieve the sort of societies members wanted to build and how they could be brought into being. International Monetary Fund strictures weren't abandoned but were significantly softened in a final balancing of the Asian financial crisis ledger.

Modest levies on international financial transactions and travel were agreed and hypothecated for regional public goods. There was also a major effort to support domestic development resource mobilisation, both public and private. Several countries introduced minimum taxation rates for both companies and individuals. The MDBs delivered on their promise to prioritise domestic capital market growth.

Fitfully, driven by crisis, the international system responded, not only to climate change but also to a wide range of other pressing international challenges. Resourcing and policy belatedly caught up with altered 21st-century realities, as middle-level powers pooled more of their sovereignty to get things done. By 2035, there was tentative optimism that the world was getting back on track.

Notes

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Part 6
Conclusions and policy recommendations

18. Conclusions and policy recommendations

Robert Glasser

The contributions to this volume cover a very wide range of security issues, but they share one underlying theme: climate change will very soon cause enormous disruptions across human society. Avoiding the worst of those disruptions will require rapid, highly ambitious climate action today. There are many reasons why states aren't already acting with a greater sense of urgency, including the influence of political and economic special interest groups, lack of financing and domestic political dynamics, but a contributing factor is that policymakers have failed to recognise the globally systemic nature of the climate-change threat and how rapidly systemic impacts will begin appearing.

Many ideas and recommendations for accelerating climate action have been advanced in this book. Fundamentally important is the need for better climate risk information to inform policy planning. This applies not only to building climate models with higher resolution (down to regional or local scales, where climate impacts are felt),[1] but also to improving our understanding of the relationships between climate influences and hazards[2] and particularly how they can trigger other hazards and cause cascading disruptions in human systems.[3]

The need for better information applies to virtually every aspect of the chain of events connecting the changing climate to societal impacts, which will transform the Indo-Pacific security environment. The chapters have highlighted a number of those aspects, including the need to better articulate the health impacts of climate change in the Indo-Pacific; building our understanding of the connections between climate disruptions and religious extremism, transnational crime and ethnic separatism; clarifying the links between climate and migration; delineating the connections between climate change and inequality; and clarifying how climate impacts at global and regional levels combine to undermine food security in countries.

Improved climate information is also essential for ensuring that civilian and military planners can make investments in infrastructure and military systems—and social and economic investments more broadly—that accurately take account of the way climate change is amplifying disaster risk with increasingly serious security consequences. In most places today, disaster risk is determined primarily by the historical record of disasters. That's no longer sufficient, because climate change is rapidly and significantly altering those risks. Hazards, such as extreme floods and bushfires, are increasingly occurring in places that have never before been affected by them. Over half of the homes destroyed in the devastating floods caused by Hurricane Harvey in Texas, for example, were outside the 1-in-500-year flood plain.[4] More accurate climate and hazard information is essential for climate-informed development and to enable reliable risk assessments and resilient investments.

This information is as important for the military as it is for government and commercial planners. Climate change is exposing military facilities to greater hazards and changing the operational requirements for equipment and training. Military planners and intelligence agencies also need this knowledge to better anticipate a wide range of regional threats, from political instability to transnational crime and piracy.

The book includes many additional recommendations to bolster security and stability by investing in climate-change adaptation and risk reduction. Recognising that vulnerable populations, such as people living in poverty and smallholder farmers who rely on rain-fed agriculture, are the most at risk from climate change, many authors have commented on the need to prioritise investments in social protection measures. In many less developed countries in the Indo-Pacific, large segments of the population, particularly in the informal sector, are excluded from government social safety nets. In the context of increasing climate-driven disasters, that coverage gap not only has significant humanitarian consequences, but security consequences as well, as described below.

Aid donor countries have an important role to play in supporting social protection in the Indo-Pacific. Innovative measures to reduce disaster risk, such as parametric insurance,[5] and cash transfers in anticipation of imminent disasters will be increasingly important. It will also be critical to build the resilience of core sectors, such as agriculture, water and health, to diminish the need for emergency measures after hazards strike. Assisting countries to transition to drought- and flood-resistant crops, including through agricultural extension models and the diversification of water-supply and flood-control systems, will also be critical. For donor countries, many such interventions will seem 'back-to-the-future', resembling the early aid interventions associated with the Green Revolution.[6]

It's highly unlikely that the region will transition smoothly from fossil-fuel-based economies to renewables. The analysis suggests that there will be winners and losers. The losing countries will see major reductions in revenue and many stranded assets, with major implications for their ability to finance economic development and respond effectively to climate-driven disasters (or to harmful non-state actors exploiting the disruptions). The regional demand for electricity is likely to increase, particularly in the context of rapidly warming temperatures, and power shortages and other major disruptions are possible. China, which is already positioning itself to be the major supplier of renewable technologies, is likely to become the major provider of large-scale power-supply infrastructure to its regional neighbours, but increasingly in competition with India.

Reducing the security risks associated with the energy transformation will require major public and private financing for low-carbon growth in the region. Wealthy countries and the multilateral development banks need to play a key role in mobilising that funding, including by leveraging their investments to reduce sovereign risk associated with stranded assets and the exposure of countries to climate hazards.

Several regional climate 'hotspots' have been identified in the analysis that are relevant to the risk of great-power competition, instability and conflict. They include some that are well

known, such as the South China Sea, where sea-level rise and overlapping claims of sovereignty have already resulted in conflict over fishing rights and tensions between the US and China, and the southern Philippines and West Papua in Indonesia, both of which are highly exposed to climate hazards and are grappling with ethnic separatist movements.

Other hotspots highlighted in the book include the Mekong River basin, where China increasingly controls the river flow to the downstream states of Cambodia, Laos and Vietnam, which are under growing pressure from the salination of freshwater and extreme flooding linked to climate change. Similarly, the Brahmaputra River, shared by India and China, is a hotspot, not just because of increasing resource pressures linked to climate change, but also because of the tense bilateral relationship, including recent border clashes that were the deadliest in over four decades.[7] Another climate hotspot is the Indus River basin, which is shared primarily by India and Pakistan—two countries that also have a history of conflict. Water disputes are intensifying.[8] Over 70% of Pakistan's water resources originate beyond its borders in India, and Pakistan has limited options to reduce the risks, as its reservoirs can only hold 34 days of Indus River inflows.

Several authors have commented on specific vulnerabilities faced by China. China has 20% of global population but only 12% of the world's arable land (much of which is threatened by climate-related drought), and many of its aquifers in the north of the country are already overexploited. Given China's geopolitical importance, its core role in the global energy transformation, its significant exposure to climate hazards and its association with many of the regional climate hotspots, it's surprising that there exist few, if any, comprehensive climate and security risk assessments of the country's role in the Indo-Pacific. That's an omission that urgently needs to be addressed.

The need for multilateral engagement in reducing climate and security threats also features throughout the book. Some examples include strengthening dispute resolution mechanisms for transboundary river basins; engaging with the UN Convention on the Law of the Sea to address the geographical extent of the maritime entitlements of states (which are changing as a result of sea-level rise); establishing 'mobility corridors' for pastoralists seeking access to water and fodder during extreme droughts; the creation of an Indo-Pacific humanitarian and disaster response force and an early-warning Indo-Pacific climate intelligence centre; measures to strengthen existing regional health-prevention, health-surveillance and health-response systems; the negotiation of an agreement in the G20 to avert the abrupt introduction of food export bans and food tariffs in response to food price spikes (as a means of preventing cascading food insecurity globally); and a regional initiative to identify ways to regulate digital disinformation in the wake of major climate disruptions.

One of the most interesting and useful insights from the book is about the *connections* that emerge between many of the risks identified in individual chapters. The risks and impacts in one thematic area are amplified by risks in other areas, and the compound impact is likely to be greater than the sum of its parts. Climate risk assessments that are conducted in organisational or sectoral silos will underestimate the impacts.

Here are just a few of the connections across thematic areas that emerge from a holistic reading of the chapters:

- Climate hazards, such as floods and droughts, will have major impacts on food security, particularly during extreme El Niños and La Niñas. They may also simultaneously disrupt electric-power production, industrial output, and water-supply and sanitation systems. Without cooling and clean water, waterborne disease may increase and health impacts may multiply. Dengue fever outbreaks may become more severe. Flooding may prevent affected populations from reaching hospitals to access urgent care. Trade disruptions, such as damaged national and regional seaports, will undermine government efforts to access emergency food and medical supplies. Governments might not be able to purchase food from abroad, given that there are likely to be similar food-security challenges globally. In any case, damaged infrastructure may make it impossible for governments to reach communities isolated by disasters.
- The financial capacities of governments to respond effectively may be diminished by the increasing cost of responding to previous disasters, including escalating reconstruction costs. Their financial capacity to respond may be further curtailed by diminishing revenue due to climate impacts on agricultural and other exports, and lack of access to financing from capital markets due to high levels of sovereign risk (linked to stranded fossil-fuel assets and high exposure to climate hazards). Their national income may decline further if they have historically relied on income from fossil-fuel exports and have been unable to manage the transition to renewables effectively. Such diminished government resourcing may weaken social safety nets, undermine maintenance and other investments in water-supply and flood-control infrastructure, increase food insecurity and reduce national capacity to respond to disasters.
- Harmful non-state actors, such as ethnic separatists and religious extremists, may exploit the disruptions caused by disasters, in particular the collapse of government services, to recruit new members. In those circumstances, digital disinformation may become a powerful tool to foster anti-government sentiment.
- Large concentrations of people may be displaced by the disruptions. Many may come into conflict with communities in areas that receive them. Others may move to cities, where they may turn to crime, become radicalised more easily and exacerbate existing instabilities. Extremely poor people may become trapped in place following disasters, with bleak prospects for survival without outside aid. Still others, with the resources to move across borders, may become climate refugees, triggering a response from regional militaries seeking to enforce their borders. The Chinese and US militaries may be drawn into the emerging disruptions for humanitarian reasons, to support government stabilisation efforts or out of concern that the other might exploit the situation for strategic advantage. The chaotic operating environment may increase the risk of miscalculation and confrontation.

If we could put on a pair of glasses that somehow magically enabled us to see climate risks, the risks would not, as the complex chain of connections described above suggests, fit neatly into bureaucratic, sectoral or organisational silos, but rather cut across them, including at

varying temporal and spatial scales (from local to global). The glasses would instantly reveal the inadequacy of the current silo-based climate planning conducted by most governments, reflected in, for example, the development of national climate-adaptation plans being led by environment ministries.

The gathering and intensifying climate risks must be addressed through a comprehensive process directed by the highest levels of government, using the best available climate and hazard information, and applying a framework that incorporates local, national, regional and global-scale risks, impacts and connections. Engaging governments in the region in conducting an Indo-Pacific climate and security risk assessment should be an important early contribution to national climate risk assessments. It would also be an opportunity to identify joint initiatives involving aid programs, the region's militaries, finance ministries, disaster management agencies, multilateral development banks and others, to reduce the climate and security risks.

Most critically, this book highlights the enormous stakes involved in preventing dangerous climate change. The overall costs of reducing greenhouse gas emissions and accelerating the global energy transition to renewables is dwarfed by the cost of responding to the major systemic impact that climate change will have on regional security in all its dimensions. In this respect, our current settings, frameworks and investments are inadequate; most of those challenges will require multilateral responses and possibly new institutions to meet the unprecedented security risks. The Indo-Pacific is already the most hazard-prone region in the world.

We have a limited window of opportunity to avoid the serious climate impacts illustrated in this book, and the far more devastating disruptions that will emerge if the climate warms to 2°C and beyond. Our response must reflect the systemic nature of the threat.

Summary of recommendations

1. Governments in the Indo-Pacific region, individually and collectively, should urgently build their understanding of regional climate and security risks, including the political, economic, social and military dimensions, through a comprehensive process led by the highest levels of governments, using the best available climate and hazard information and applying a framework that incorporates local, national, regional and global-scale risks, impacts and connections. Underpinning the risk assessment, and its future iterations, should be:
   - accelerated efforts to increase the resolution of climate models to improve their usefulness for policy planning and investments
   - increased research on the relationships between climate influences and hazards and particularly how they can trigger other hazards and cause cascading disruptions in human systems
   - the identification of the connections between climate disruptions and religious extremism, transnational crime, ethnic separatism and migration.

2. Food insecurity is a major risk. Governments need to rapidly develop a shared understanding of how climate impacts at global and regional levels combine to undermine food security at national levels.
   - G20 members should consider negotiating an agreement to avert the abrupt introduction of food export bans and food tariffs in response to food price spikes.
3. Governments should ensure that climate risk information is incorporated in civilian and military planning and investments in infrastructure, military systems, and social and economic investments more broadly to correct historically based underestimates of the scale and frequency of the hazards we can expect in future.
4. Given the implications of climate change for regional stability and security, donor countries should rapidly scale up support for less developed countries to build their resilience to climate disruptions that have major consequences for security. This should include:
   - expanding social protection measures, particularly for vulnerable populations
   - increased use of innovative aid and blended finance mechanisms, such as parametric insurance, catastrophe bonds and cash transfers, in anticipation of imminent disasters
   - strengthening essential services relating to food, water and health, including assisting countries to transition to drought- and flood-resistant crops, to access agricultural extension models and to diversify water-supply, sanitation and flood-control systems.
5. A global initiative is needed to mobilise major public and private financing for low-carbon growth in the region, engaging wealthy countries, multilateral development banks and capital markets. The initiative should be particularly aimed at countries with high sovereign risk, for example those with high fossil-fuel dependence and assets highly exposed to climate hazards.
6. Further research is needed on the security dimensions of climate hotspots identified in this book, including the:
   - South China Sea
   - southern Philippines
   - Papuan provinces of Indonesia
   - Mekong River basin
   - Brahmaputra River basin
   - Indus River basin.
7. A comprehensive climate and security risk assessment of China's role in the Indo-Pacific should be produced as a matter of priority.
8. The multilateral initiatives to reduce climate and security risk proposed in this book should be developed further, such as engaging the UN Convention on the Law of the Sea to address the geographical extent of the maritime entitlements of states.

Notes

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Acronyms and abbreviations

ADB	Asian Development Bank
ADMM Plus	ASEAN Defence Ministers' Meeting Plus
AI	artificial intelligence
ARMOR	*ASEAN risk monitor and disaster management review*
ASEAN	Association of Southeast Asian Nations
ASG	Abu Sayyaf Group
China Eximbank	Export–Import Bank of China
CO_2	carbon dioxide
DENV	dengue virus
DFI	development financing institution
EU	European Union
FPDA	Five Power Defence Arrangements
GCC	Gulf Cooperation Council
GFC	global financial crisis
HADR	humanitarian assistance and disaster relief
IPCC	Intergovernmental Panel on Climate Change (UN)
IT	information technology
KAS	Konrad-Adenauer-Stiftung
MDB	multilateral development bank
NDCs	nationally determined contributions
ND-GAIN	Notre Dame Global Adaptation Initiative
OECD	Organisation for Economic Co-operation and Development
PICs	Pacific island countries
PIDF	Pacific Islands Development Forum
PIF	Pacific Islands Forum
PPP	public–private partnership
PyroCb	pyro-cumulonimbus
Quad	Quadrilateral Security Dialogue
SDGs	Sustainable Development Goals
SIS	Smaller Island States

SSPs	shared socioeconomic pathways
TCFD	Taskforce for Climate-related Financial Disclosures
UN	United Nations
UNFCCC	UN Framework Convention on Climate Change
WFP	World Food Programme (UN)
WTO	World Trade Organization

The geopolitics of climate and security in the Indo-Pacific

Climate change is much more than an environmental crisis—it's a systemic crisis that will transform the geopolitical landscape. And the consequences for the Indo-Pacific, already the most exposed region in the world to climate hazards and home to the world's fastest growing populations, economies and geopolitical rivalries, will be profound.

In this volume, leading experts explore the impacts of this rapidly emerging climate threat on regional systems by interrogating a 1.5°C 2035 climate change scenario developed by the ASPI Climate and Security Policy Centre.

The chapters here attempt to understand the unpredictable effects of climate change on the region's already fragile human systems, from great-power competition and militaries, governance and politics, food and water insecurity, and ethnic separatism, to energy and trade systems, sovereign risk and digital disinformation.

What emerges is a vivid demonstration of the dangers of underestimating the systemic connections between those factors, including how risks in one thematic area amplify risks in others, completely reshaping the regional security picture.