DISASTER ALLEY

CLIMATE CHANGE CONFLICT & RISK

WRITTEN BY
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FOREWORD BY
SHERRI GOODMAN

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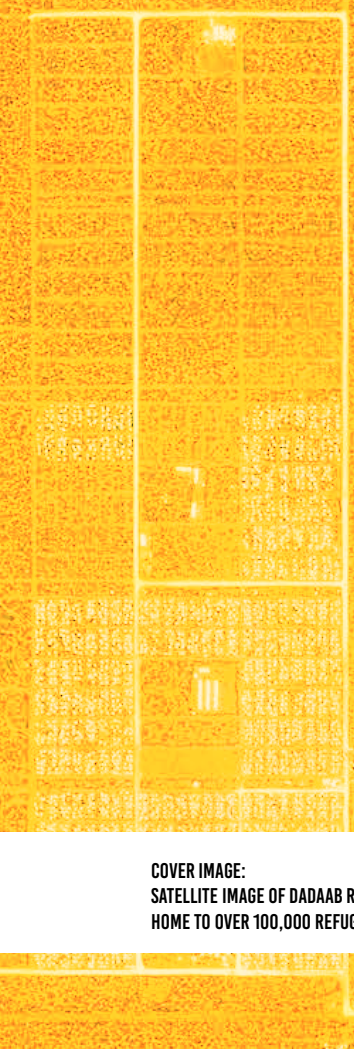

COVER IMAGE:
SATELLITE IMAGE OF DADAAB REFUGEE CAMP, KENYA.
HOME TO OVER 100,000 REFUGEES

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OVERVIEW

The first responsibility of a government is to safeguard the people and their future well-being. The ability to do this is threatened by climate change, whose accelerating impacts will also drive political instability and conflict, posing large negative consequences to human society which may never be undone. This report looks at climate change and conflict issues through the lens of sensible risk-management to draw new conclusions about the challenge we now face.

- **From tropical coral reefs to the polar ice sheets, global warming is already dangerous. The world is perilously close to, or passed, tipping points which will create major changes in global climate systems.**

- **The world now faces existential climate-change risks which may result in "outright chaos" and an end to human civilisation as we know it.**

- **These risks are either not understood or wilfully ignored across the public and private sectors, with very few exceptions.**

- **Global warming will drive increasingly severe humanitarian crises, forced migration, political instability and conflict. The Asia–Pacific region, including Australia, is considered to be "Disaster Alley" where some of the worst impacts will be experienced.**

- **Building more resilient communities in the most vulnerable nations by high-level financial commitments and development assistance can help protect peoples in climate hotspots and zones of potential instability and conflict.**

- **Australia's political, bureaucratic and corporate leaders are abrogating their fiduciary responsibilities to safeguard the people and their future well-being. They are ill-prepared for the real risks of climate change at home and in the region.**

- **The Australian government must ensure Australian Defence Force and emergency services preparedness, mission and operational resilience, and capacity for humanitarian aid and disaster relief, across the full range of projected climate change scenarios.**

- **It is essential to now strongly advocate a global climate emergency response, and to build a national leadership group outside conventional politics to design and implement emergency decarbonisation of the Australian economy. This would adopt all available safe solutions using sound, existential risk-management practices.**

FOREWORD

BY SHERRI GOODMAN

In April 2017, I was invited by Breakthrough to visit Australia and talk to elected representatives, key government officials and business leaders, researchers and analysts, and at public meetings, to advance awareness of the capacity of climate change to amplify global conflict and instability, social and economic disruption, humanitarian crises and forced migration.

Working at the highest level in the United States on these issues for more than two decades, I have come to understand that these impacts have already placed the internal cohesion of many nations under great stress, including in the United States, as a result of a dramatic rise in migration, changes in weather patterns and water availability. The flooding of coastal communities around the world, from low-lying Pacific Islands to the United States, Europe, South Asia and China, has the potential to challenge the very survival of regional communities and even some nation states.

My tour to Australia was also an opportunity to discuss what needs to be done. Internationally, we must establish methods to better forecast potentially disruptive climate changes – such as severe drought – well in advance. Only then can we develop the capacity for reducing risks through building global and community resilience and strength before we encounter full-on crises. We also need to rethink refugee governance to better support the climate refugees who will comprise an increasing proportion of the refugee mix. Current governance structures are simply inadequate.

Strengthening the resilience of vulnerable nations to the climate impacts already locked into the system is critical; however this will only reduce long-term risk if improvements in resilience are accompanied by strong actionable agreements to stabilise the climate.

Climate change is a threat multiplier to humanity that demands a whole-of-society response. If Australia recognises this reality it would be placed, inter alia, at the leading edge of innovation and competitiveness in the advanced energy economies that are rapidly evolving in China and elsewhere in Asia.

Responding effectively to climate change requires greatly increased co-operation globally, regionally and among Australian institutions, to build more resilient communities. Australia is at an inflection point in its approach to climate, energy and security. It is time to act with clarity and urgency.

Sherri Goodman is former US Deputy Undersecretary of Defence for Environmental Security, Founder and Executive Director of the CNA Military Advisory Board, and a Senior Fellow at Woodrow Wilson International Center for Scholars.

"WHAT IS THE BIGGEST LONG-TERM THREAT IN THE PACIFIC REGION? CLIMATE CHANGE."

ADMIRAL SAMUEL LOCKLEAR
FORMER COMMANDER
US PACIFIC COMMAND (PACOM)

TENT CAMP, SOMALIA, 2013. SADIK GULEC / SHUTTERSTOCK.COM

PENTAGON, 11 SEPTEMBER 2001

A FAILURE OF IMAGINATION

Climate change is an existential risk that could abruptly end human civilisation because of a catastrophic "failure of imagination" by global leaders to understand and act on the science and evidence before them.

At the London School of Economics in 2008, Queen Elizabeth questioned: "Why did no one foresee the timing, extent and severity of the Global Financial Crisis?" The British Academy answered a year later: "A psychology of denial gripped the financial and corporate world… [it was] the failure of the collective imagination of many bright people… to understand the risks to the system as a whole" (Stewart 2009).

A "failure of imagination" has also been identified as one of the reasons for the breakdown in US intelligence around the 9/11 attacks in 2001.

A similar failure is occurring with climate change today.

The problem is widespread at the senior levels of government and global corporations. A 2016 report, *Thinking the Unthinkable*, based on interviews with top leaders around the world, found that: "A proliferation of 'unthinkable' events… has revealed a new fragility at the highest levels of corporate and public service leaderships. Their ability to spot, identify and handle unexpected, non-normative events is… perilously inadequate at critical moments… Remarkably, there remains a deep reluctance, or what might be called 'executive myopia', to see and contemplate even the possibility that 'unthinkables' might happen, let alone how to handle them." (Gowing and Langdon 2016)

Such failures are manifested in two ways in climate policy. At the political, bureaucratic and business level in underplaying the high-end risks and in failing to recognise that the existential risk of climate change is totally different from other risk categories. And at the research level in underestimating the rate of climate change impact and costs, along with an under-emphasis on, and poor communication of, those high-end risks.

EXISTENTIAL RISK

An existential risk is an adverse outcome that would either annihilate intelligent life or permanently and drastically curtail its potential (Bostrom 2013). For example, a big meteor impact or large-scale nuclear war.

Existential risks are not amenable to the reactive (learn from failure) approach of conventional risk management, and we cannot necessarily rely on the institutions, moral norms, or social attitudes developed from our experience with managing other sorts of risks. Because the consequences are so severe – perhaps the end of human global civilisation as we know it – "even for an honest, truth-seeking, and well-intentioned investigator it is difficult to think and act rationally in regard to… existential risks" (Bostrom and Cirkovic 2008).

Yet the evidence is clear that climate change already poses an existential risk to global stability and to human civilisation that requires an emergency response. Temperature rises that are now in prospect could reduce the global human population by 80% or 90%. But this conversation is taboo, and the few who speak out are admonished as being overly alarmist.

Prof. Kevin Anderson considers that "a 4°C future [relative to pre-industrial levels] is incompatible with an organized global community, is likely to be beyond 'adaptation', is devastating to the majority of ecosystems, and has a high probability of not being stable" (Anderson 2011). He says: "If you have got a population of nine billion by 2050 and you hit 4°C, 5°C or 6°C, you might have half a billion people surviving" (Fyall 2009).

Asked at a 2011 conference in Melbourne about the difference between a 2°C world and a 4°C world, Prof. Hans Joachim Schellnhuber replied in two words: "Human civilisation". The World Bank reports: "There is no certainty that adaptation to a 4°C world is possible" (World Bank 2012). Amongst other impacts, a 4°C warming would trigger the loss of both polar ice caps, eventually resulting, at equilibrium, in a 70-metre rise in sea level.

The present path of greenhouse gas emissions commits us to a 4–5°C temperature increase relative to pre-industrial levels. Even at 3°C of warming we could face "outright chaos" and "nuclear war is possible", according to the 2007 *Age of Consequences* report by two US think tanks (see page 10).

Yet this is the world we are now entering. The Paris climate agreement voluntary emission reduction commitments, if implemented, would result in the planet warming by 3°C, with a 50% chance of exceeding that amount.

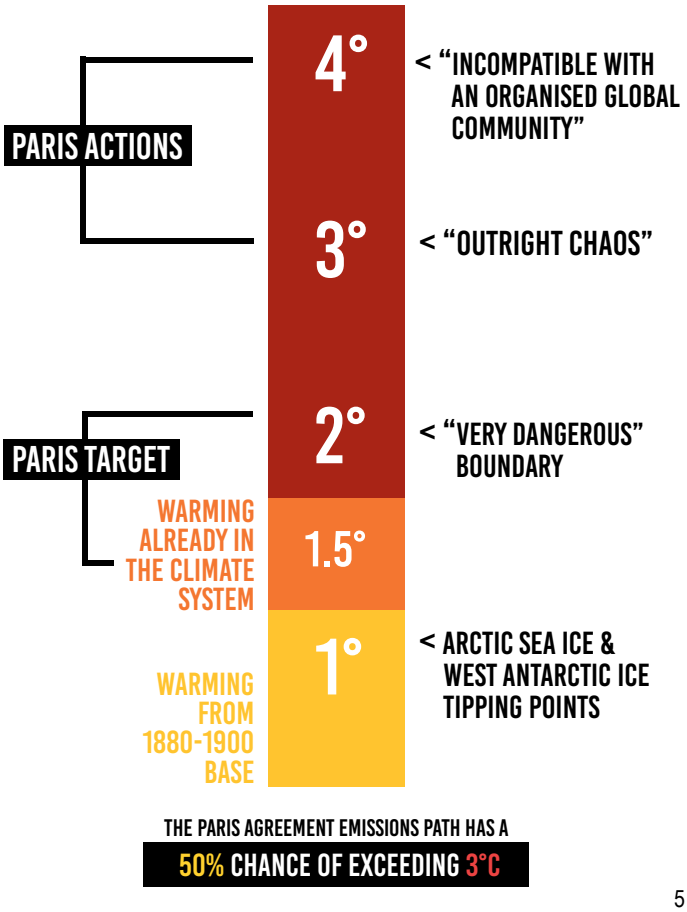
This does not take into account "longer-term" carbon-cycle feedbacks – such as permafrost thaw and declining efficiency of ocean and terrestrial carbon sinks, which are now becoming relevant. If these are considered, the Paris emissions path has more than a 50% chance of exceeding 4°C warming. (Technically, accounting for these feedbacks means using a higher figure for the system's "climate sensitivity" – which is a measure of the temperature increase resulting from a doubling of the level of greenhouse gases – to calculate the warming. A median figure often used for climate sensitivity is ~3°C, but research from MIT shows that with a higher climate sensitivity figure of 4.5°C, which would account for feedbacks, the Paris path would lead to around 5°C of warming (Reilly et al. 2015).)

So we are looking at a greater than one-in-two chance of either annihilating intelligent life, or permanently and drastically curtailing its potential development. Clearly these end-of-civilisation scenarios are not being considered even by risk-conscious leaders in politics and business, which is an epic failure of imagination.

The world hopes to do a great deal better than Paris, but it may do far worse. A recent survey of 656 participants involved in international climate policy-making showed only half considered the Paris climate negotiations were useful, and 70% did not expect that the majority of countries would fulfil their promises (Dannenberg et al. 2017).

Human civilisation faces unacceptably high chances of being brought undone by climate change's existential risks yet, extraordinarily, this conversation is rarely heard. The Global Challenges Foundation (GCF) says that despite scientific evidence that risks associated with tipping points "increase disproportionately as temperature increases from 1°C to 2°C, and become high above 3°C", political negotiations have consistently disregarded the high-end scenarios that could lead to abrupt or irreversible climate change. In its *Global Catastrophic Risks 2017* report, it concludes that "the world is currently completely unprepared to envisage, and even less deal with, the consequences of catastrophic climate change". (GCF 2017)

PARIS EMISSIONS PATH & CLIMATE RISKS



SCHOLARLY RETICENCE

The scientific community has generally underestimated the likely rate of climate change impacts and costs. Intergovernmental Panel on Climate Change (IPCC) reports are years out of date upon publication. Sir Nicholas Stern wrote of the IPCC *Fifth Assessment Report*: "Essentially it reported on a body of literature that had systematically and grossly underestimated the risks [and costs] of unmanaged climate change" (Stern 2016).

Too often, mitigation and adaptation policy is based on least-drama, consensus scientific projections that downplay what Prof. Ross Garnaut called the "bad possibilities", that is, the lower-probability outcomes with higher impacts. In his 2011 climate science update for the Australian Government, Garnaut questioned whether climate research had a conservative "systematic bias" due to "scholarly reticence". He pointed to a pattern, across diverse intellectual fields, of research predictions being "not too far away from the mainstream" expectations: and observed in the climate field that this "has been associated with understatement of the risks". (Garnaut 2011)

In 2007, *The Age of Consequences* reported:

" Our group found that, generally speaking, most scientific predictions in the overall arena of climate change over the last two decades, when compared with ultimate outcomes, have been consistently below what has actually transpired. There are perhaps many reasons for this tendency—an innate scientific caution, an incomplete data set, a tendency for scientists to steer away from controversy, persistent efforts by some to discredit climate "alarmists," to name but a few..." (Campbell et al. 2007)

For many critical components of the climate system, we can identify just how fast our understanding is changing. Successive IPCC reports have been reticent on key climate system issues:

- **Antarctica**: In 2001, the IPCC projected no significant ice mass loss by 2100 and, in the 2014 report, said the contribution to sea level rise would "not exceed several tenths of a meter" by 2100. In reality, the Amundsen Sea sector of the West Antarctic Ice Sheet has been destabilised and ice retreat is unstoppable for the current climate state. It is likely that no further acceleration in climate change is necessary to trigger the collapse of the rest of the ice sheet, with suggestions of a 3–5 metre sea-level rise within two centuries from West Antarctic melting. (Spratt 2017)
- **Sea levels:** In the 2007 IPCC report, sea levels were projected to rise up to 0.59 metre by 2100. The figure was widely derided by researchers, including the head of NASA's climate research (Hansen 2007) as being far too conservative. By 2014, the IPCC's figure was in the range 0.55 to 0.82 metre, but they included the caveat that "levels above the likely range cannot be reliably evaluated." In reality, most scientists project a metre or more. The US Department of Defence uses scenarios of 1 and 2 metres for risk assessments, and the US National Oceanic and Atmospheric Administration provides an "extreme" scenario of 2.5 metres sea level rise by 2100 (NOAA 2017).
- **Arctic sea ice:** In 2007, the IPCC reported that summer sea-ice was "projected to disappear almost completely towards the end of the 21st century", even as it was collapsing that year. In 2014, the IPCC had ice-free projections to 2100 for only the highest of four emissions scenarios. In reality, Arctic sea ice has already lost 70% of summer volume compared to just thirty years ago, and expectations are of sea-ice-free summer within a decade or two.
- **Coral reefs:** Just a decade or two ago, the general view in the literature was that the survival of coral systems would be threatened by 2°C warming. In 2009, research was published suggesting that preserving more than 10% of coral reefs worldwide would require limiting warming to below 1.5°C (Frieler et al. 2009). The coral bleaching events of the last two years at just 1–1.2°C of warming indicate that coral reefs are now sliding into global-warming-driven terminal decline. Three-quarters of the Great Barrier Reef has been lost in the last three decades, with climate change a significant cause.

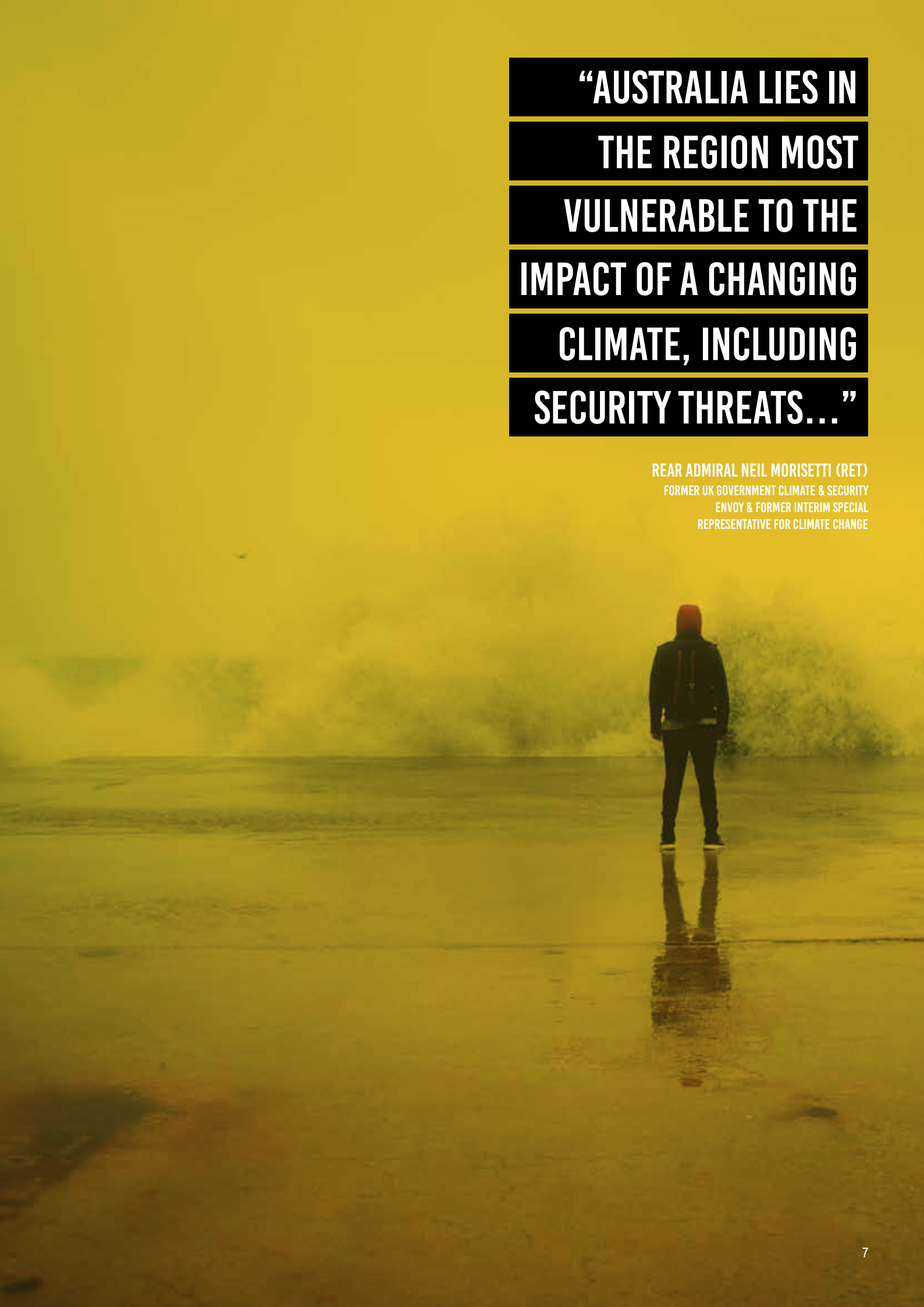
Climate change assessments need:

" a much more thorough exploration of the [high-end] tails of the distributions of physical variables such as sea level rise, temperature, and precipitation, where our scientific knowledge base is less complete, and where sophisticated climate models are less helpful. We need greater attention on the strength of uncertain processes and feedbacks in the physical climate system… to determine scientifically plausible bounds on total warming and the overall behavior of the climate system. Accomplishing this will require synthesizing multiple lines of scientific evidence… as well as new modeling experiments to better explore the possibility of extreme scenarios. " (Weaver et al. 2017)

A prudent risk-management approach for safeguarding people and protecting their ways of life means a tough and objective look at the real risks to which we are exposed, including climate and conflict risks, and especially those "fat tail" events whose consequences are damaging beyond quantification, and which human civilization, as we know it, would be lucky to survive. We must understand the potential of, and plan for, the worst that can happen and be relieved if it doesn't. If we focus on "middle of the road" outcomes, and ignore the "high-end" possibilities, we will probably end up with catastrophic outcomes that could have been avoided.

It is not a question of whether we may suffer a failure of imagination. We already have. Yet people understand climate risks, even as political leaders wilfully underplay or ignore them. 84% of 8000 people in eight countries recently surveyed for the Global Challenges Foundation consider climate change a "global catastrophic risk". The figure for Australia was 75%. The GCF report found that many people now see climate change as a bigger threat than other concerns such as epidemics, population growth, weapons of mass destruction and the rise of artificial intelligence threats. GCF vice-president Mats Andersson says "there's certainly a huge gap between what people expect from politicians and what politicians are doing" (Goering 2017).

The survey also found 81% of 1000 Australians polled agreed with the proposition: "Do you think we should try to prevent climate catastrophes, which might not occur for several decades or centuries, even if it requires making considerable changes that impact on our current living standards?" (ComRes 2017).



“AUSTRALIA LIES IN THE REGION MOST VULNERABLE TO THE IMPACT OF A CHANGING CLIMATE, INCLUDING SECURITY THREATS…”

REAR ADMIRAL NEIL MORISETTI (RET)
FORMER UK GOVERNMENT CLIMATE & SECURITY ENVOY & FORMER INTERIM SPECIAL REPRESENTATIVE FOR CLIMATE CHANGE

AN ACCELERANT TO INSTABILITY

A hotter planet has already taken us close to, or past, tipping points which will generate major changes in global climate systems such as the oceans, polar sea ice and ice sheets and large permafrost carbon stores (Spratt 2016). The impacts include a hotter and more extreme climate, stronger storms and cyclones, drought and desertification, and coastal inundation.

Climate change impacts basic resources such as food and water, which allow human societies to survive. Scarce resources, declining crop yields and rising prices become catalysts for conflict (CNA MAB 2014).

This makes climate change a key component in international relations as it aggravates pre-existing problems to function as a "threat multiplier", causing escalating cycles of humanitarian crises, political instability, forced migrations and conflicts. The war in Syria and conflicts across the Sahel from Darfur to Mali have a major climate-change fingerprint (Werrell and Femia 2013).

A number of circumstances made the Syrian state extremely vulnerable to the consequences of the severe drought which hit the country a decade ago. Declining oil revenues and a fiscal deficit led the Syrian government to slash fuel subsidies in May 2008. The price of petrol tripled overnight, and pushed up food prices, whilst the state's agriculture policies encouraged groundwater depletion. And Syria had already accepted 1.5 million refugees from Iraq. From 2006-2010, 60% of Syria had its worst long-term drought and crop failures since civilisation began. 800,000 people in rural areas had lost their livelihood by 2009. More than two million people were driven into extreme poverty, and 1.5 million people migrated to cities. The cities grew very rapidly, as did food and housing prices. The Syrian regime was unable to safeguard the people and protect their way of life, resulting in social breakdown, state failure, the rise of Islamic State and foreign military intervention. Global and regional climatic changes were major underlying causes and continued to exacerbate this already explosive situation.

Extreme weather and climate change also played a part in the "Arab Spring". Per capita, the world's top nine wheat importers are in the Middle East and North Africa. The region relies on food imports for more than 30% of calories consumed, making it highly vulnerable to global food price shocks. In 2010, a heatwave and wildfires in Ukraine and Russia, and a "once-in-a-century" winter drought in China, resulted in wheat shortages and a global wheat price spike, with bread prices rocketing across the Middle East. Food riots followed in Egypt, where basic food costs were already one-third of household budgets, and became one trigger for the Arab Spring. (Werrell and Femia 2013)

The European migration crisis is a consequence of multiple conflicts, accelerated by climate change. This crisis was driven by the wars in Iraq and Afghanistan, the civil war in Syria, the Arab Spring, political disruption across the Maghreb, and drought, desertification and war across the Sahel.

"CLIMATE CHANGE IS IMPACTING STABILITY IN AREAS OF THE WORLD WHERE OUR TROOPS ARE OPERATING TODAY"

MARINE CORPS GENERAL JIM MATTIS
U.S SECRETARY OF DEFENSE

These recent climate-accelerated conflicts also point to the changing character of the major players, and transcend old understandings:

" We are seeing the steady erosion of the nation-state as the primary international security entity. Non-state actors, such as globalized financial institutions and corporations, and even internet-empowered individuals – or the causes they represent – are having increasing impacts on the political landscape. The world has also become more politically complex and economically and financially interdependent. We believe it is no longer adequate to think of the projected climate impacts to any one region of the world in isolation. Climate change impacts transcend international borders and geographic areas of responsibility." (CNA 2014)

Australia's near region includes communities increasingly threatened by climate impacts and the resulting effects including dislocation and migration. The climate and conflict hotspots of Pakistan and the Philippines are discussed on pages 14-15. A Pacific scenario is outlined on page 19.

Sixty per cent of Vietnam's urban areas are 1.5 metres or less above sea level. The Mekong Delta provides 40% of Vietnam's agricultural production, and more than half of national rice production and agricultural exports. Yet the Delta is also very vulnerable to coastal inundation, with over half its area less than two metres above sea level.

Bangladesh is the "ground zero" of climate change impacts, says Maj. Gen. Munir Muniruzzaman, former military adviser to the president of Bangladesh and chairman of the Global Military Advisory Council on Climate Change (Daily Mail 2016). A one-metre sea level rise would flood 20% of the area of Bangladesh and displace 30 million people. India has already surrounded Bangladesh with a double strand "climate refugee" fence patrolled by 80,000 troops, in anticipation of a migration crisis.

Estimates of global average sea-level rise this century range from 1 to 2.5 metres, but that is just the beginning. In 2009, eminent climate scientist Prof. Hans Joachim Schellnhuber warned that 1°C of warming – the current state – would "in the long run translate into 15–20 meters sea level rise at equilibrium. 2°C – the target of the European Union – means sea level rise of 30–40 meters over maybe a thousand years. Draw a line around your coast, probably not a lot would be left". (Zieler 2009)

The consequences of unabated climate change cannot be resolved by an emphasis on increasing militarisation, as demonstrated by the example of sea level rise. Nowhere is this clearer than in the case of climate-driven forced mass migrations:

" Perhaps the most worrisome problems associated with rising temperatures and sea levels are from large-scale migrations of people – both inside nations and across existing national borders… potentially involving hundreds of millions of people. The more severe scenarios suggest the prospect of perhaps billions of people over the medium or longer term being forced to relocate. The possibility of such a significant portion of humanity on the move, forced to relocate, poses an enormous challenge even if played out over the course of decades." (Campbell et al. 2007)

THE GROWING WATER CRISIS

The impact of climate change on the health and wellbeing of peoples and nations starts with one element above all others: water.

Following the water flow reveals how a hotter and more extreme climate is likely to trigger or exacerbate conflict and migration. This, in turn, points to humanitarian intervention and resource allocation to build community resilience as a means of alleviating the drivers of future conflict and preventing wars.

It is with more extreme and prolonged droughts that this journey starts, across the southern and eastern Mediterranean in places such as Syria, and across the African Sahel.

Between 1970 and the mid-1990s, the amount of economically available water per person globally dropped by more than 35%, according to the United Nations. One estimate projects a gap of 40% between global water requirements and accessible, reliable water supply by 2030 (WRG 2009).

Today, approximately 1.8 billion people around the world lack access to safe drinking water and nearly two billion people lack access to sanitation. According to the 2017 report, *Global Trends: Paradox of Progress*, "more than 30 countries – nearly half of them in the Middle East – will experience extremely high water stress by 2035, increasing economic, social, and political tensions" (US NIC 2017). Countries already experiencing water stress or far worse include Egypt, Jordan, Turkey, Iraq, Israel, Syria, Yemen, India, China, and parts of the United States.

As the world's population and living standards continue to grow, the projected climate impacts on the nexus of water, food, and energy security become more profound:

" Fresh water, food, and energy are inextricably linked, and the choices made over how these finite resources will be produced, distributed, and used will have increasing security implications… From today's baseline of 7.1 billion people, the world's population is expected to grow to more than 8 billion by 2025… by 2030, population growth and a burgeoning global middle class will result in a worldwide demand for 35% more food and 50% more energy. Rising temperatures across the middle-latitudes of the world will increase the demand for water and energy. These growing demands will stress resources, constrain development, and increase competition among agriculture, energy production, and human sustenance. In light of projected climate change, stresses on the water-food-energy nexus are a mounting security concern across a growing segment of the world. " (CNA MAB 2014)

The decline of water availability and its distribution will be pivotal as climate change causes tropical wet zones to become wetter and subtropical dry zones to become drier. Scientists project the subtropical zone will experience a 5–10% reduction in precipitation for each degree Celsius of global warming.

INDIA & CHINA

Over the coming decades, climate change is projected to cause southern Australia, portions of India, and much of inland China to experience sustained drought, resulting in lowered agricultural production and food security issues (CNA MAB 2014).

Many of the major river systems in Asia – home to more than a billion people – are fed by glacial melt from the Himalayas and the Tibetan Plateau. With less snowfall and the predicted shrinking of glaciers, in the future they may not provide enough water to meet year-round demand. Water challenges will increase the risk of instability and state failure, and exacerbate regional tensions in South Asia. India's national water supply is forecast to fall 50% below demand as early as 2030, and increasing irregularities in the pattern of monsoon rains are likely to undermine South Asia's agricultural and domestic water needs. (Ahmed 2017)

Exacerbating the growing water crisis in Asia is the overuse of groundwater, leading to falling water tables in India and China.

China contains 20% of global population but only 7% of available fresh water. Changing climate patterns are causing droughts and increasing desertification, with freshwater reserves falling 13% between 2000 and 2009. 24,000 villages in north and west China have been abandoned due to desertification in the last 50 years, and the advancing Gobi Desert is now only 150 miles from Beijing. In rural areas, 300 million people have no access to safe drinking water, and 54% of the main rivers contain water unfit for human consumption. (Cho 2011)

Four-fifths of China's grain harvest comes from irrigated land, most of it drawing on surface water, principally the Yellow and Yangtze rivers, which are fed from the Tibetan Plateau. The water table under the North China Plain, an area that produces half of the country's wheat and a third of its corn, is falling fast. Overpumping has largely depleted the shallow aquifer, forcing well-drillers to turn to the region's deep aquifer, which is not replenishable. A World Bank report on China's water situation foresees "catastrophic consequences for future generations" unless water use and supply can quickly be brought back into balance (Brown 2013).

TOO MUCH WATER

Whilst drought is a long-term climate change challenge in Asia, in some cases too much water is an immediate problem. More intense monsoons driven by warmer sea-surface temperatures are an increasing threat to the region, a phenomenon hitting China's coastal region and the Philippines. Witness the destructive force of Typhoon Haiyan in 2013. As the sea level rises, storm surges will become more invasive, more destructive, costlier, and deadlier. Densely populated areas, including many large cities along coasts or major waterways are particularly vulnerable to monsoon and storm surge flooding (CNA MAB 2014):

- Asia has 15 of the world's 20 largest urban areas – including Tokyo, Jakarta, Mumbai, and Dhaka – and most are on the coast or alongside low-lying deltas, vulnerable to inundation.
- Low-lying nations – such as Bangladesh, and island countries such as the Maldives and Kiribati – face existential threats in the near term from sea level rise and devastating storm flooding.
- Projected sea-level rise will put critical regions at risk, including key rice growing areas, Asia's primary food staple.

CLIMATE CHANGE "… CAN ADD TO THE CHALLENGES OF GLOBAL INSTABILITY, HUNGER, POVERTY, AND CONFLICT"

CHUCK HAGEL
FMR US SECRETARY OF DEFENSE

SCENARIO: THE AGE OF CONSEQUENCES

Scenario planning is a structured way to think about the future. It does not say "this will happen", but constructs a possible future based on analysis of what could credibly happen, and asks: "what would be the consequences, and what actions could we take now to change this possible future?" This is important where the event may be low in probability but high in impact: nuclear war, for example. And climate change.

In 2007, two US think tanks produced an extraordinary report titled *The Age of Consequences: The foreign policy and national security implications of global climate change* (Campbell et al. 2007). This report constructs three scenarios, of which the second is titled "Severe". This scenario assumes that climate responds much more strongly to continued carbon loading over the next few decades than predicted by current scientific models, and hypothesises profound and potentially destabilising global consequences over the course of the next human generation or longer.

SETTING THE SCENARIO

It is worth considering this scenario's assumptions, because most of them appear to be now in play, though the timeline may vary with current circumstances.

" Average global surface temperature rises at an unexpectedly rapid rate to 2.6°C above 1990 levels by 2040, with larger warming over land masses and at high latitudes. Dynamical changes in polar ice sheets (i.e., changes in the rate of ice flow into the sea) accelerate rapidly, resulting in 0.52 meters of global mean sea level rise. Based on these observations and an improved understanding of ice sheet dynamics, climate scientists by this time express high confidence that the Greenland and West Antarctic Ice Sheets have become unstable and that 4 to 6 meters of sea level rise are now inevitable over the next few centuries. Water availability decreases strongly in the most affected regions at lower latitudes (dry tropics and subtropics), affecting about 2 billion people worldwide. The North Atlantic MOC [Meridional Overturning Circulation] slows significantly, with consequences for marine ecosystem productivity and fisheries. Crop yields decline significantly in the fertile river deltas because of sea level rise and damage from increased storm surges. Agriculture becomes nonviable in the dry subtropics, where irrigation becomes exceptionally difficult because of low water availability and increased soil salinization resulting from more rapid evaporation of water from irrigated fields. Arid regions at low latitudes expand, taking previously marginal productive croplands out of production. North Atlantic fisheries are affected by significant slowing of the North Atlantic MOC. Globally, there is widespread coral bleaching, ocean acidification, substantial loss of coastal nursery wetlands, and warming and drying of tributaries that serve as breeding grounds for anadromous fish (i.e., ocean-dwelling fish that breed in freshwater, e.g., salmon). Because of a dramatic decrease in the extent of Arctic sea ice, the Arctic marine ecosystem is dramatically altered and the Arctic Ocean is navigable for much of the year. Developing nations at lower latitudes are affected most severely because of climate sensitivity and low adaptive capacity. Industrialized nations to the north experience clear net harm and must divert greater proportions of their wealth to adapting to climate change at home. "

SCENARIO CONSEQUENCES

This is how the scenario played out.

" In the case of severe climate change, corresponding to an average increase in global temperature of 2.6°C by 2040, massive nonlinear events in the global environment give rise to massive nonlinear societal events. In this scenario, nations around the world will be overwhelmed by the scale of change and pernicious challenges, such as pandemic disease. The internal cohesion of nations will be under great stress, including in the United States, both as a result of a dramatic rise in migration and changes in agricultural patterns and water availability. The flooding of coastal communities around the world, especially in the Netherlands, the United States, South Asia, and China, has the potential to challenge regional and even national identities. Armed conflict between nations over resources, such as the Nile and its tributaries, is likely and nuclear war is possible. The social consequences range from increased religious fervor to outright chaos. In this scenario, climate change provokes a permanent shift in the relationship of humankind to nature."

It is should be noted that "2.6°C above 1990 levels" is ~3.1°C above the late nineteenth-century baseline, as a means of providing a comparison with the Paris outcome. The current emissions path from the Paris accord is for 3°C or more of warming, so this scenario may well represent the future (Climate Interactive 2017). The consequences are clear:

" Perhaps the most worrisome problems associated with rising temperatures and sea levels are from large-scale migrations of people – both inside nations and across existing national borders… potentially involving hundreds of millions of people. The more severe scenarios suggest the prospect of perhaps billions of people over the medium or longer term being forced to relocate. The possibility of such a significant portion of humanity on the move, forced to relocate, poses an enormous challenge even if played out over the course of decades…"

" The scale of the potential consequences associated with climate change —particularly in more dire and distant scenarios —made it difficult to grasp the extent and magnitude of the possible changes ahead. Global temperature increases of more than 3°C and sea level rises measured in meter… pose such a dramatically new global paradigm that it is virtually impossible to contemplate all the aspects of national and international life that would be inevitably affected. The collapse and chaos associated with extreme climate change futures would destabilize virtually every aspect of modern life."
(Campbell et al. 2007)

CASE STUDIES

MALI

The crises in Mali in 2012–2014 were shaped by an intersection of three trends: desertification and food insecurity exacerbated by climate change; an ongoing rebellion by Arab Tuareg nomadic herdsmen in northern Mali; and weak government institutions that could not address the marginalization of the Tuareg and their increasing clashes with non-Arab Muslim ethnic sedentary agriculturalist tribes in the southern and central areas of the country. Overwhelmed by these challenges, the fragile government was overthrown by a coup in March 2012 but the Malian political system was unable to maintain influence in northern Mali. Al Qaeda in the Islamic Maghreb and other groups moved in and took control. (CNA MAB 2014)

SAHEL

The Malian conflict fits a pattern of other such conflicts in Africa's Sahel region, including Darfur, South Sudan, Niger, and Nigeria. Climate change – particularly drought and desertification – have impacted the region for hundreds of years; yet the region's environmental stressors have now become a threat multiplier across Sub-Saharan Africa, and have contributed to conflict dynamics in countries that have never enjoyed popular internal sovereignty in the post-colonial era or robust institutions to settle conflicts over vital resources. Add to this the involvement of transnational militias such as Al Qaeda in the Islamic Maghreb and the Janjaweed in Darfur, and these conflicts become more complex, transforming resource competition into ethnopolitical conflict. (CNA MAB 2014)

NIGERIA

There is a basic causal mechanism that links climate change with violence in Nigeria. A US report concludes that in Nigeria poor responses to climatic shifts created shortages of resources such as land and water, which were followed by negative secondary impacts, such as more sickness, hunger, and joblessness. The inadequate government response provoked unrest. Many Boko Haram foot soldiers were people displaced by severe drought and food shortages in neighboring Niger and Chad. Some 200,000 farmers and herdsman had lost their livelihoods and, facing starvation, crossed the border to Nigeria. The inadequacy of the government's climate adaptation programs led to exposure of the vast population of farmers in northern Nigeria to harsh environmental effects, consequently generating conflict. (Ahmed 2017)

IRAQ

The rapid rise of Islamic State (ISIS) in 2014 coincided with a period of unprecedented heat in Iraq from March to May 2014. Recurrent droughts and heavy rainstorms have played havoc with Iraq's agriculture, and the Shi'ite-dominated government largely failed to address the burgeoning challenges of dwindling water supplies and waning agriculture. ISIS moved quickly to exploit these failures, for instance by using dams as a weapon of war, and filling the vacuum left by the incapacity of the central government to feed its own population and deliver basic goods and services. (Ahmed 2017)

SYRIAN REFUGEE, TURKEY - 2015. KAFEINKOLIK / SHUTTERSTOCK.COM

HOTSPOT: PAKISTAN

Pakistan is a clear example of a country where the social and political landscape and susceptibility to climate harm are a potentially unstable mix. Increasing instability in Pakistan would contribute to the risk of instability in India and even China, which are key economic partners for Australia.

Pakistan is a pivot state between Central and South Asia. Salafist Islamist non-state actors play a significant role in conflict in Pakistan's immediate neighbourhood and within the country. Armed opposition groups target energy infrastructure. The military and intelligence have a powerful say in politics. The Pakistani state has a direct interest in wars in neighbouring Afghanistan and in disputed Kashmir, and it is nuclear armed.

Climate change has contributed to recent record-breaking drought events. On 30 May 2017, the thermometer in Turbat, Balochistan hit 54°C, the hottest reliably measured temperature ever recorded in Asia. In 2010, devastating floods affected one-fifth of the land area and 20 million people, destroyed 1.7 million homes, and damaged 5.4 million acres of arable land. The damage was made worse by a shift in the distribution of monsoonal rainfall to areas of the country with poorer flood mitigation measures. Increases in the frequency and intensity of drought and flooding are consistent with climate change projections.

Pakistan will face severe water scarcity by 2025 and is "one of the most water-stressed countries in the world" (World Bank 2005), driven by changing snow melt from the Himalayan/Karakoram ranges, more variable monsoons, increases in population, inefficient drainage practices, a shift in agriculture towards more water-intensive export cropping, and competing demands for water by the agriculture and power generation sectors.

Pakistan's agricultural sector relies heavily on irrigation. 80% of agricultural land is irrigated (not rain-fed), the highest proportion in the world. Agriculture employs 45% of workers. Cotton, textiles and clothing make up half of Pakistan's exports.

In quantitative terms, cubic yards of surface water available per person fell from 6,880 in 1951 to 1,358 in 2010. By 2025 it is projected to decrease to 1,046 cubic yards.

The Indus river system is the core of Pakistan's water system and most flow comes from Karakoram glaciers in its headwaters. There is evidence that glacial changes may be reducing river flows. The Karakoram glaciers have stable or increasing areas and possibly mass – with reduced melt flows – and are behaving differently from rapidly retreating eastern Himalaya glaciers.

Competition for water between the agricultural and power sectors is already intense and is likely to increase.

Decreased flows in the Indus, and decisions to allocate water to irrigation instead of power generation, have been in part responsible for ongoing electrical blackouts. Power shortfalls in summer are up to half of demand, with power outages of up to 18–20 hours driving protests and increasing civil unrest. In one episode in 2012 rioters "burned trains, damaged banks and gas stations, looted shops, blocked roads, and, in some instances, targeted homes of members of the National Assembly and provincial assemblies" (Steinbruner et al. 2013).

The blackouts are "a contentious political issue with the potential to inflame Pakistan–India relations. The Pakistani foreign minister blamed the decreased flows on illegal water withdrawals upstream by India", although the commissioner of the Indus River System Authority in Pakistan attributed them to climate change (Steinbruner et al. 2013).

UNREST IN PAKISTAN COULD CONTRIBUTE TO INSTABILITY OF AUSTRALIA'S KEY ECONOMIC PARTNERS

HOTSPOT: PHILIPPINES

Key factors for identifying where large-scale violence, regime change, or state breakdown may occur include:

- Semi-democratic regimes which are corrupt, favour special groups and lack “diffuse” legitimacy and support.
- Climate/disaster responses are under-resourced, poorly managed, and lacking compassion.
- Well-organized pre-existing opposition groups within the system (parties) or outside (mass movements/ insurgencies capable of leading or increasing anti-regime violence). (Steinbruner et al. 2013)

From this perspective, the Philippines may become a climate and conflict hotspot. Politics is fiercely contested – often on the streets – and the current president is authoritarian, unpredictable and violent. There is a decades-old, re-energised insurgency in the south with some leadership allegiance to ISIS, bolstered by a flow of militants from Indonesia and those returning from the Middle East.

Climate warming impacts include more extreme flooding, prolonged and intensified droughts, more powerful typhoons, and intense storm surges.

The Philippines was ranked as the fifth most affected nation by climate-related disasters between 1994 and 2013. Manila is one of the most vulnerable cities in the world to inundation from rising sea levels and was rated as the second-most-at-risk city to climate change in the world, in the “extreme” category, in 2013. Manila can expect more power shortages, disease and interruptions to water supply with more warming.

Oceans to the east of the Philippines are the most rapidly warming surface waters anywhere in the world, driving cyclones such as Typhoon Haiyan in 2013, which was the most powerful tropical cyclone to make landfall in recorded history. Over the past 37 years, typhoons that strike East and Southeast Asia have intensified by 12–15%, with the proportion of storms of categories 4 and 5 having doubled or even tripled (Mei and Xie 2016). In 2009, during tropical storm Ondoy, a month’s worth of rain fell on Manila and 25 provinces in a few hours. Nearly 80% of Manila was flooded, 246 people died and hundreds of thousands had to be evacuated.

Climate change and human activities have taken a heavy toll on coral reef ecosystems, on which millions of Filipinos depend for food and income. 75% of the mangrove area has been lost, as has 30–50% of the country’s seagrass beds in the last 50 years.

Climate change will have a modestly negative effect on rice, sugarcane, and banana yields, and a large negative effect on maize. Climate change will increase prices of agricultural food and this will disproportionately affect poor people (Thomas et al. 2016). The country’s food production system is highly vulnerable. One in four Filipinos live below the poverty line.

TYPHOON HAIYAN WAS THE MOST POWERFUL TROPICAL CYCLONE TO MAKE LANDFALL

TYPHOON HAIYAN SURVIVORS

AUSTRALIA: SHIRKING RESPONSIBILITY

Australian institutions are failing in their fiduciary responsibility to safeguard the people and their future well-being. Australia is also failing as a world citizen, by downplaying the profound global impacts of climate change and shirking its responsibility to act.

Australia's per capita greenhouse emissions are in the highest rank in the world, and its commitment to reduce emissions are rated as inadequate by leading analysts. For example, Climate Action Tracker says that "Australia's current policies will fall well short of meeting" its Paris agreement target, that the Emissions Reduction Fund "does not set Australia on a path that would meet its targets" and "without accelerating climate action and additional policies, Australia will miss its 2030 target by a large margin" (CAT 2016).

Australia's biggest corporations are no better. The S&P/ ASX All Australian 50 has the "highest embedded carbon" of any group in the S&P Global 1200, according to the S&P Dow Jones *Carbon Scorecard* report, which assesses global companies' carbon footprint, fossil fuel reserve emissions, coal revenue exposure, energy transition and green-brown revenue strain (Investor Daily 2017). At the 2017 Annual General Meeting of Santos, one of Australia's biggest oil and gas companies, chairman Peter Coates asserted that it is "sensible" and "consistent with good value" (Davidson 2017) to assume for planning purposes a 4°C-warmer world, thus abrogating his director's responsibility to understand and act on the risks of climate change.

The most dangerous aspect of fossil-fuel investments made today is that their impacts do not manifest themselves for decades to come. If we wait for catastrophe to happen – as we are doing – it will be too late to act. Time is the most important commodity. To avoid catastrophic outcomes requires emergency action to force the pace of change.

To have a realistic chance of meeting the Paris aspiration of constraining the temperature increase "to well below 2°C, and to pursue efforts to limit the temperature increase to 1.5°C" means that no new fossil fuel projects – coal, oil or gas – can be built globally, and that existing operations have to be rapidly replaced. As well, carbon drawdown technologies to reduce the amount of atmospheric carbon – which do not currently exist at scale – need to be rapidly deployed.

In these circumstances, opening up a major new coal province, as both the Federal Liberal–National Party and the Queensland Labor governments, along with the Federal Opposition, are proposing in Queensland's Galilee Basin, is a crime against humanity.

The defence sectors of Australia's key partners are taking climate change very seriously, but government disinterest means that Australia itself is much less well prepared. The conflict and security aspects of climate change were flagged a decade ago, but have not been a significant component of public discourse in Australia in recent years. Media commentators have accorded it little space. Defence and security think tanks in general have not given the issue a high priority, and some have barely been in this field at all. The output from Australia's intelligence analysts appears negligible.

Recent reports by the Centre for Policy Development (Sturrock and Ferguson 2015) and the Climate Council (2015) have highlighted Australia's relatively poor state of preparedness and policy-making on these issues, in comparison to the USA and the UK. The public reports produced by think tanks are, in general, somewhat timid compared to the forthrightness of those of the CNA Military Advisory Board, and *The Age of Consequences* (Campbell et al. 2007). The science overviews in the Australian reports, which generally take the IPCC framing at face value, often lack critical perspective on high-end risks. This contributes to a failure of imagination in assessing potential challenges.

Successive defence white papers have all but ignored the topic, until limited recognition in the most recent white paper. A major stumbling block continues to be successive ministers for defence and their cabinet colleagues who have, by their lack of interest and public commitment, frustrated the Department of Defence's (DoD) efforts to develop their climate preparedness work. No committee of either house of the Australian Parliament has specifically reported upon these issues. Neither of the two main political parties displays a deep understanding or accepts the real implications of climate change for Australians' security.

The Global Change and Energy Sustainability Initiative, within the DoD, has had some success in assessing risks to the defence estate and preparedness, pushing climate change up the agenda. One significant public sign of this work were remarks by Lieutenant General Angus Campbell to the 2016 Chief of Army's Exercise, in which he identified climate change ("an unstable planet") as one of the three issues central to the security challenges Australia will encounter in redefining boundaries for the 21st century land force (Campbell 2016).

The Longest Conflict, a report by the Centre for Policy Development (Sturrock and Ferguson 2015), assessed Australia's security response to climate change as "parts without a whole", noting:

" Most of the defence officials and experts interviewed for this study acknowledged Australia has not integrated climate security considerations into broader national security and defence strategic frameworks. Indeed, Australia has been unique among developed states because of the absence of a climate and energy security discourse…"

" Interviewees offered a number of explanations for the absence of a strategic framework. One was that, whilst there is significant concern about climate change amongst middle and junior level defence bureaucrats, the defence establishment as a whole remains resistant to 'securitising' climate change. This resistance stems from both those who do not believe that climate change is a serious problem and those who accept the climate science but do not believe climate change should be conceived of as a security issue…"

" Most interviewees intimated that the most significant factor inhibiting climate security in Australia is the reluctance to embroil the DoD or the Australian Defence Force (ADF) in climate change politics, which have become extremely divisive and partisan in Australia in recent years. When asked why the senior ADF personnel have not been prepared to echo the call of the US top brass to make climate change a defence priority, one senior defence department official pointed to the differences in political culture between the two countries. In the US, this official suggested, the defence establishment is pushing very hard publicly on climate security largely to force a recalcitrant Congress to take the issue seriously… whereas the policy-making culture in Australia is generally more technocratic and secretive. "

" [The] Global Change and Energy Sustainability Initiative… attempts to improve the understanding of climate change on defence preparedness. The Initiative … draws upon research done across the services, connects with academia, think tanks and other government agencies such as CSIRO or the Office of the Chief Scientist. The Initiative has made progress in recent years [including] to assess the impact of climate risks on ADF operational capability…"

The Department of Defence is making significant progress in mission preparedness and operational resilience, but there has been less work done thinking about strategic implications of climate change impacts on regional stability.

At a federal government department level, some steps are being taken in inter-agency work and moving towards a whole-of-government approach, especially with regard to domestic emergency and climate resilience, but consideration of the full extent of the broader international climate and conflict risks remains very inadequate.

HOT TOPIC: PROTECTION

OUR MORAL SYSTEM

The first responsibility of a government is to safeguard the people and protect their way of life.

Safety and well-being is valued in all aspects of our lives: at home and around the swimming pool and at the beach, in the workplace, on the road, and in our schools. In business, engineering and government, this is practised as risk management. We value keeping people well and safe from harm with our health system, insurance, social security, and emergency services, and we value protecting nature.

The basis of democracy, according to the cognitive linguist George Lakoff, is "empathy – citizens caring for each other, both social and personal responsibility – acting on that care, and an ethic of excellence". From these, our freedoms and our way of life follow, as does the role of government: to protect and empower a nation's citizens. Empowerment starts with education and infrastructure. No one can be free without these, and without a commitment by one's fellow citizens to care and to act on that care says Lakoff.

In his 2004 book, *Don't Think of an Elephant,* Lakoff explains:

"First, if you empathize with your child, you will provide protection. This comes into politics in many ways. What do you protect your child from? Crime and drugs, certainly. You also protect your child from cars without seat belts, from smoking, from poisonous additives in food. So progressive politics focuses on environmental protection, worker protection, consumer protection, and protection from disease. These are the things that progressives want the government to protect their citizens from. But there are also terrorist attacks, which liberals and progressives have not been very good at talking about in terms of protection. Protection is part of the progressive moral system, but it has not been elaborated on enough. And on September 11, progressives did not have a whole lot to say. That was unfortunate... Protection is important. It is part of our moral system."

A failure to protect vulnerable communities from climate change impacts is behind the daily news from Africa, The Middle East, Asia and the Pacific, but the news often lacks the climate context. By locating climate responses in a moral system of protection, we can better engage the community in action to minimise future climate harm.

DISASTER ALLEY SCENARIOS

Australia is already experiencing some of the extreme impacts of climate change, including extended heat waves above 40°C, catastrophic bushfires and record rains and flooding. Fortunately, severe heatwaves and floods have not yet occurred simultaneously, but this can be anticipated with the increasing intensity and frequency of such events. However extreme events and climate impacts such as coastal inundation within our region do not seem to receive much attention. The two preliminary scenarios outlined here are a way of thinking about how such climate change-driven regional crises could directly impact Australia, and how we might act.

These scenarios were constructed on the basis of the following.

- **Rising sea levels:** Low-lying Pacific islands, Asian cities (such as Manila, Bangkok, Shanghai, Kolkata) and river deltas in the region (including the Mekong, Brahmaputra and Ganges, China's Pearl River industrial/export zone, the Rewa in Fiji and Fly in PNG) are all vulnerable to rising sea levels and inundation from high-intensity cyclones and storm surges. China's Pearl River Delta special industrial zone in Guandong Province is responsible for 20% of national GDP, more than 30% of foreign direct investment, and 40% of China's exports, but is less than two metres above sea level and built on a sinking delta. It contains the second greatest number of people (after Kolkata) estimated to be at risk of flooding anywhere in the world. In 2012, the ports of Guandong handled more than 1.2 billion tons of freight. "Hard" defences are not considered to be feasible.
- **Cyclones:** Cyclone Haiyan, which hit the Philippines in 2013, was the strongest cyclone on record to make landfall anywhere in the world, and Cyclone Winston (Fiji, 2016) was the strongest cyclone on record to make landfall in the Pacific. Cyclones are intensifying in concert with rising sea surface temperatures. Waters to the east of the Philippines are likely the fastest warming tropical waters in the world.
- **Antarctica:** It is likely that climate change has already triggered the collapse of the West Antarctic Ice Sheet (WAIS), with loss of a significant fraction of WAIS on a decadal to century time-scale. Antarctica alone could contribute more than a metre of sea-level rise by 2100. A US government agency has just lifted its maximum sea-level rise estimate to 2.5 metres by 2100.
- **Water insecurity:** More variable monsoon patterns and strong El Ninos will add to the problem of water insecurity across Asia and the Pacific. As the climate becomes hotter, the dry season may extend in length and droughts are likely to become more severe. Small island developing states are especially vulnerable to the effect of drought and flooding on food production, which can affect the whole country. A strong El Nino in 2015–16 caused significant drought and frosts across Melanesia, with negative impacts on agriculture, water supply, women's labor and villagers' health. By late 2015, a maximum of 770,000 people in Papua New Guinea – nearly 10% of the population – were living in locations where food was very or extremely scarce.

SCENARIO: THE CHINA SYNDROME

In this scenario, in China's north a water crisis deepens as decreased snowmelt flows from the Tibetan Plateau intersect with overexploitation of groundwater, reduced irrigation capacity, and a two-year northern monsoon failure. A political crisis develops in impoverished rural communities, strengthened in the north-west by long-standing grievances among the Muslim minority, and there is significant internal migration to the large cities.

A category 5 typhoon hits the Pearl River Delta/Guandong free trade zone, and storm surges inundate half of the delta, destroying infrastructure and significantly disabling export capacity for up to a year.

Consequently, the Chinese economy stalls and tips into recession, while chronic and opaque debt, especially in the state sector, cascades into a full-blown credit crisis. The crash infects Asian markets, and Australian banks are exposed. As Chinese output stagnates, Australian resource exports fall, putting further pressure on a fragile Australian domestic stock market. (China is Australia's largest trading partner, while Australia is a leading source of resources for China.)

Chinese employers try to replace organised labour with new migrants from the countryside, but workers resist, especially in unionised overseas firms in the Guandong zone, and labour disputes escalate. The middle class joins the revolt as they lose out from over-leveraged stocks in a plunging share market. The state cracks down, and maintaining civil order becomes their focus.

An emboldened United States decides the crisis provides an opportunity to challenge Chinese sovereignty claims in the South China Sea. This security crisis in East Asia intersects with a new Asian financial crisis in Australia's largest export market.

"NEITHER THE WORLD NOR AUSTRALIA ARE PREPARED FOR THE SERIOUS, LARGE-SCALE IMPACTS OF CLIMATE CHANGE ON VULNERABLE COMMUNITIES AND REFUGEE PATTERNS"

ADMIRAL CHRIS BARRIE (RET)
FMR CHIEF OF THE AUSTRALIAN DEFENCE FORCE

PACIFIC HUMANITARIAN AIRDROP MISSION

SCENARIO: PACIFIC OVERLOAD

Small Pacific nations are increasingly unhappy with Australia's climate policies. The President of the Marshall Islands, Dr Hilda C. Heine, told the audience at the S.T. Lee Lecture at the Australian National University in Canberra on 16 May 2017 that:

" Now is not the time to be debating the science, trashing solar power, or building new coal mines… I can assure you it does influence the way Australia is viewed in the Pacific… Imagine how you'd feel if your big brother or big sister was not only openly mocking the science but even occasionally mocking your very own plight… This not only does your country disservice, it openly weakens your ability to be a force for good on the world stage " (Fettes 2017).

In this scenario, a tsunami storm surge has a devastating impact on a significant portion of the coastline of the Solomon Islands due to the loss of natural coastal defences that exist there today, including coral reefs, mangroves and kelp forests. Australia deploys significant resources including a Canberra-class landing helicopter dock (LHD) ship to the politically-fragile state, and is also called upon for help by Papua New Guinea to provide aid and assistance due to an ongoing severe drought. Humanitarian assistance and disaster relief capacity provided by the Australian government and aid organisations is stretched.

The problem worsens when a helicopter crash on Australia's only other LHD ship immobilises the vessel, and the ADF helicopter fleet is grounded. (The grounding of ADF air fleets occurred following the Navy's Sea King helicopter crash on Nias in April 2005 during the Aceh aid deployment, and the crash of a Blackhawk helicopter during naval exercises off Fiji during Operation Quickstep at the time of the 2006 coup. Both of Australia's LHD ships are out of operation for most of 2017 with serious propulsion problems.)

An intense cyclone then hits Fiji's capital, Suva. Australia cannot respond adequately. China, which has spent two decades building relationships in the Pacific region and funding local infrastructure, development programs and business investment, says it will act to assist and evacuate stranded Chinese nationals, using naval forces already engaged in exercises in the region.

It also offers direct disaster relief support by its naval forces. Fiji accepts, and Australia faces a diplomatic crisis in the Pacific, an area which it considers its own political backyard, but which it has neglected as a declining overseas aid budget turns old friends into regional critics, as well as coming under increasing regional criticism for its rigid migration and inadequate climate policies.

RECOMMENDATIONS

In April 2017, a group of global institutions including the World Bank, the Pacific Islands Forum and the Australian Chamber of Commerce and Industry told the Turnbull government that containing the effects of climate change must be a central pillar of Australia's new foreign policy. Further mitigation and adaptation will be needed to address the economic and security impacts of the widespread upheaval it will produce. (Hunter & Wroe 2017)

Australians could live in an Asian region with 150 million climate change refugees this century, according to Prof. Alan Dupont (Lowy 2017). Dupont has been an advisor to a number of Australian ministers of defence and foreign affairs.

This is the sort of climate change scenario the Australian government must consider now, before the possible becomes the probable. Displacement and forced migration form only one element in the complex challenge of imagining a hotter world.

On the present path of climate warming, the consequences will escalate to such a level of disruption and conflict that "outright chaos" may result, and militarised solutions could play little, if any, role compared to the scale of the problem.

Climate change has moved on from a period of much talk but limited impacts, and is now turning nasty. Official rhetoric which continues to avoid the full reality of climate change must be replaced with urgent action encompassing the following responses.

RISK MANAGEMENT

We must recognise the current failure of imagination in assessing and preparing for the full range of climate change risks, and its existential implications for global financial and societal stability. Abrupt climate change can come faster than expected or planned for, forcing more reactive – rather than proactive – modes of behavior that fail to deal with the underlying issues and drive a cycle of deepening crisis. Existential risks require a different approach from conventional risk management. This includes:

- Deploying new existential risk management techniques outside conventional politics and policy making. Irreversibility, particularly if occurring on a global scale, suggests that special precautions should be taken that go well beyond those that might otherwise apply.
- A normative view of the targets required to avoid catastrophic consequences, based on the latest science and on a qualitative, moral basis, with action determined by the imperative to achieve the target. Incremental, "politically-realistic" changes from a business-as-usual mindset dominated by vested interests cannot meet this requirement.
- A frank articulation of the catastrophic risks and the necessary time frame of response. A truthful and accurate definition of the problem is 90% of the solution. With extensive community education we can develop commitment to the major transformation ahead and change the context of debate. That has not happened thus far.
- Integrating policy at the national, regional and global levels rather than treating issues such as climate, energy, the ecological crisis and resources overuse in "silos".
- Recognising the irreducible role of global leadership. The task is to change mindsets and build coalitions, so that the risks can be addressed with an emergency global response.

RECOMMENDATION 1:

UNDERSTAND THE RISKS

Establish a top-level climate and conflict task-force in Australia to urgently examine the existential risks of climate change and develop risk-management techniques and policy-making methodologies appropriate to the challenge.

WHOLE OF GOVERNMENT EMERGENCY RESPONSE

Climate change is now a wicked problem. Very rapid cuts in emissions are required, but are considered unachievable within the prevailing economic orthodoxy.

The 2015 Paris climate conference declared its aim was "to hold the increase in global average temperature to well below 2°C, and to pursue efforts to limit the temperature increase to 1.5°C", yet it agreed upon measures that would instead result in warming of 3–5°C (see page 5).

Warming of 2°C is now widely considered a boundary between "dangerous" and "very dangerous" climate change. Former NASA climate science director, James Hansen, says it is "well understood by the scientific community" that goals to limit human-made warming to 2°C are "prescriptions for disaster", because "we know that the prior interglacial period about 120,000 years ago was less than 2°C warmer than pre-industrial conditions" and sea level was at least five to nine metres higher (Hansen et al. 2015; ABC 2015).

A significant fraction of the total impacts of climate change on particular system elements occur with less than 2°C of warming. This is the case for coral reefs, fresh-water security, terrestrial vegetation and increased river flooding (Ricke et al. 2015). At the current level of warming — around 1°C above the late nineteenth century — coral bleaching is devastating, Arctic sea ice and some West Antarctic glaciers have passed their tipping points, and a multi-metre sea level rise is a medium-term consequence.

The safe level of warming for some polar system elements is well under 1°C and probably under 0.5°C. Polar researchers say the Paris commitments will not prevent Earth "crossing into the zone of irreversible thresholds" in polar and mountain glacier regions, and that crossing these boundaries may result in processes that cannot be halted unless temperatures were returned to below the pre-industrial level (ICCI 2016).

Yet human activity has already caused 1°C of warming compared to the late nineteenth century – or 1.2°C compared to the late seventeenth century pre-industrial climate – and at least another 0.5°C of warming is temporarily masked by sulfate and other cooling aerosols, whose primary source is fossil fuel combustion. There is no pathway limiting warming to under 1.5°C without unproven solar radiation management. Current emissions scenarios for 1.5°C assume "overshoot", in which the target is significantly exceeded before returning to below 1.5°C by the deployment of large-scale negative-emission technologies later in the century.

The challenges we face are not amenable to a "politically-realistic" response. Emergency action is essential when events threaten to overwhelm the capacity to respond; when failure is not an option; when action is time sensitive (delay leads to event escalation, to the point of passing climate system tipping points); and when the costs of inaction massively outweigh the costs of acting.

An emergency response is not alarmism. It is a rational precautionary "due care and diligence" response to an existential risk crisis.

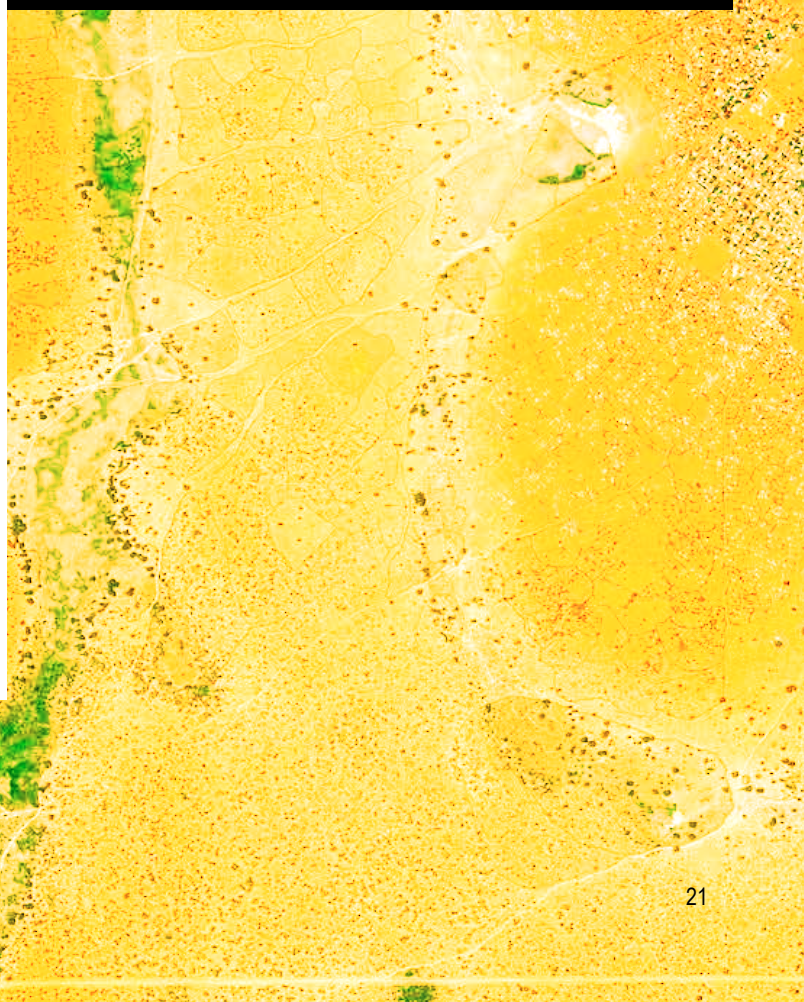
Clearly the processes of the UN Framework Convention on Climate Change through the regular Conference of the Parties are not capable of delivering the actions that are now required.

We also need to set aside the reflex taboo that some people have begun to build up around geoengineering, including drawdown and solar radiation management, and openly and rigorously assess whether these interventions are able to contribute in strategically important ways.

RECOMMENDATION 2:

EMERGENCY PROGRAM

Climate change now represents a global emergency, which threatens human civilisation. Build international processes that specifically recognise and formulate the practical steps necessary for a coordinated, global climate emergency response based on a sound, existential risk-management approach.



ZERO EMISSIONS & LARGE-SCALE CARBON DRAWDOWN AS FAST AS HUMANLY POSSIBLE

RAPID EMISSIONS REDUCTION

The scale of the challenge is reflected in a recent "carbon law" articulated by a group of leading scientists (Rockström et al. 2017). They demonstrated that for a 66% chance of holding warming to 2°C and a 50% chance of holding warming to 1.5°C (with overshoot), their "carbon law" requires:

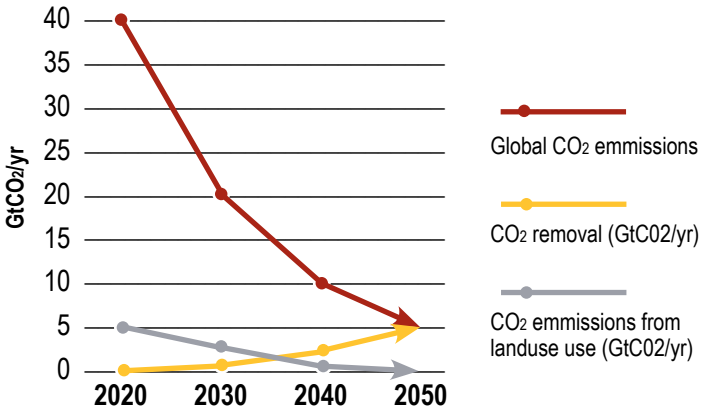
- Halving of global emissions every decade from 2020 to 2050;
- Reducing carbon dioxide emissions from land use to zero by 2050; and
- Establishing carbon drawdown capacity of 5 gigatonnes of carbon dioxide per year by 2050.

Lead author Johan Rockström says: "It's way more than adding solar or wind… It's rapid decarbonization, plus a revolution in food production, plus a sustainability revolution, plus a massive engineering scale-up [for carbon removal]." In other words, an emergency-scale effort.

As noted on page 21, the world has passed some disturbing climate milestones at the current level of 1°C of warming, so the goal must be the restoration of a safe climate well under that figure, if multi-metre sea-level rises are not to occur. The "carbon law" does not describe a safe-climate path. Such a path would include:

- A large scale transition to a safe-climate economy that delivers zero emissions and large-scale carbon drawdown as fast as humanly possible;
- All known safe solutions implemented at maximum scale now; and
- Critical research and development of solutions to close the gap between what is needed for effective protection and what is currently possible.

GLOBAL CARBON LAW GUIDING DECADAL PATHWAYS



RECOMMENDATION 3:

RAPID DECARBONISATION

Launch an emergency-scale initiative to decarbonise the Australian economy no later than 2030 and build the capacity to draw down carbon dioxide from the atmosphere while protecting food-growing capacity.

BUILDING RESILIENCE

The Paris agreement recognises the need for large-scale financing by the developed economies for the less developed economies through the Global Climate Fund to reach $US100 billion a year by 2020 from public and private sources. This would assist with mitigation and adaptation measures, based upon the principles of equity and historic responsibility. Those financing commitments have not fully materialised. Australian public climate funding has remained relatively steady since 2010, averaging A$200 million per year.

Oxfam says that, based on relative economic strength and contribution to greenhouse gas emissions, Australia's total contribution from public and private sources should reach at least A$3.2 billion per year by 2020, with at least half being public funding for adaptation (Maclellan and Meads 2016). ANU researchers have proposed that "a fair share for Australia may be around 2.4% or US$2.4 billion a year" (Jotzo et al. 2011).

In the Australian Government's 2017 budget forward estimates, the public allocation to the Fund for 2020 is $200 million, less than one-tenth of a "fair share". And whilst Paris agreed to "making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development", Japan and Australia, by contrast, consider funding for "high efficiency" coal plants should also be considered as a form of climate finance.

The UN Environment Programme says the cost of adapting to climate change in developing countries could rise to between US$280 and US$500 billion per year by 2050, a figure that is four to five times greater than previous estimates (UNEP 2016). Innovative forms of finance have been canvassed, including financial transaction taxes, use of revenues from carbon taxes and market auctions, crackdowns on corporate tax avoidance and tax havens, and re-direction of fossil fuel subsidies.

Analysts have also recognised the importance of reducing risks of instability and conflict in most vulnerable nations by building resilience and developing the capacity for early assessment of likely hotspots of instability and early intervention strategies to strengthen affected communities (CNA MAB 2014; Steinbruner et al. 2013). Ms Goodman notes in the Foreword it is critical to strengthen the resilience of vulnerable nations to climate impacts already locked into the system; yet this will reduce long-term risk only if such improvements in resilience are accompanied by strong actionable agreements to stabilise climate change.

RECOMMENDATION 4:

FINANCE RESILIENCE

Build more resilient communities in the most vulnerable nations by high-level financial commitments and development assistance; build a flexible capacity to support communities in likely hotspots of instability and conflict.

PREPAREDNESS

Recommendations on defence sector preparedness have been canvassed by several reports in Australia, including the Centre for Policy Development (Sturrock et al. 2015), the Climate Council (2015) and ASPI (Press et al. 2013), and in the USA by think tanks including the CNA Military Advisory Board. In a 2014 report, the Board recommended that US military commanders "factor in the impacts of projected climate change across their full spectrum of planning" and that "projected impacts of climate change should be integrated fully into the National Infrastructure Protection Plan and the Strategic National Risk Assessment" (CNA MAB 2014). There is also the need to develop capacity "to improve understanding of the conditions under which climate-related natural disasters and disruptions of critical systems of life support do or do not lead to important security-relevant outcomes" (Steinbruner et al. 2013).

RECOMMENDATION 5:

BE READY

Ensure all levels of government and civil society organisations are prepared for the impacts of projected climate change. Ensure Australian Defence Force preparedness, their mission and operational resilience, and their capacity for humanitarian aid and disaster relief, is adequate across the full range of projected climate change scenarios.

IMAGINATION

Within one year of Pearl Harbour, the US economy in 1942 was transformed into the world's largest producer of military goods – an astounding emergency mobilisation. Today we have the material capacity for a climate emergency mobilisation. The question is, do we have the imagination and the leadership?

In reflecting on what they had learned in researching *Thinking the Unthinkable*, Nik Gowing and Chris Langdon asked: "The big questions centre on who at the highest levels of leadership in corporates and public service will take the bold risks [that are required], not gradually or incrementally, but decisively in line with the new scale and speed that 'unthinkables' emerge.

RECOMMENDATION 6:

BUILD LEADERSHIP

Establish a national leadership group outside conventional politics, drawn from across society, charged with implementing the national climate emergency program.

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