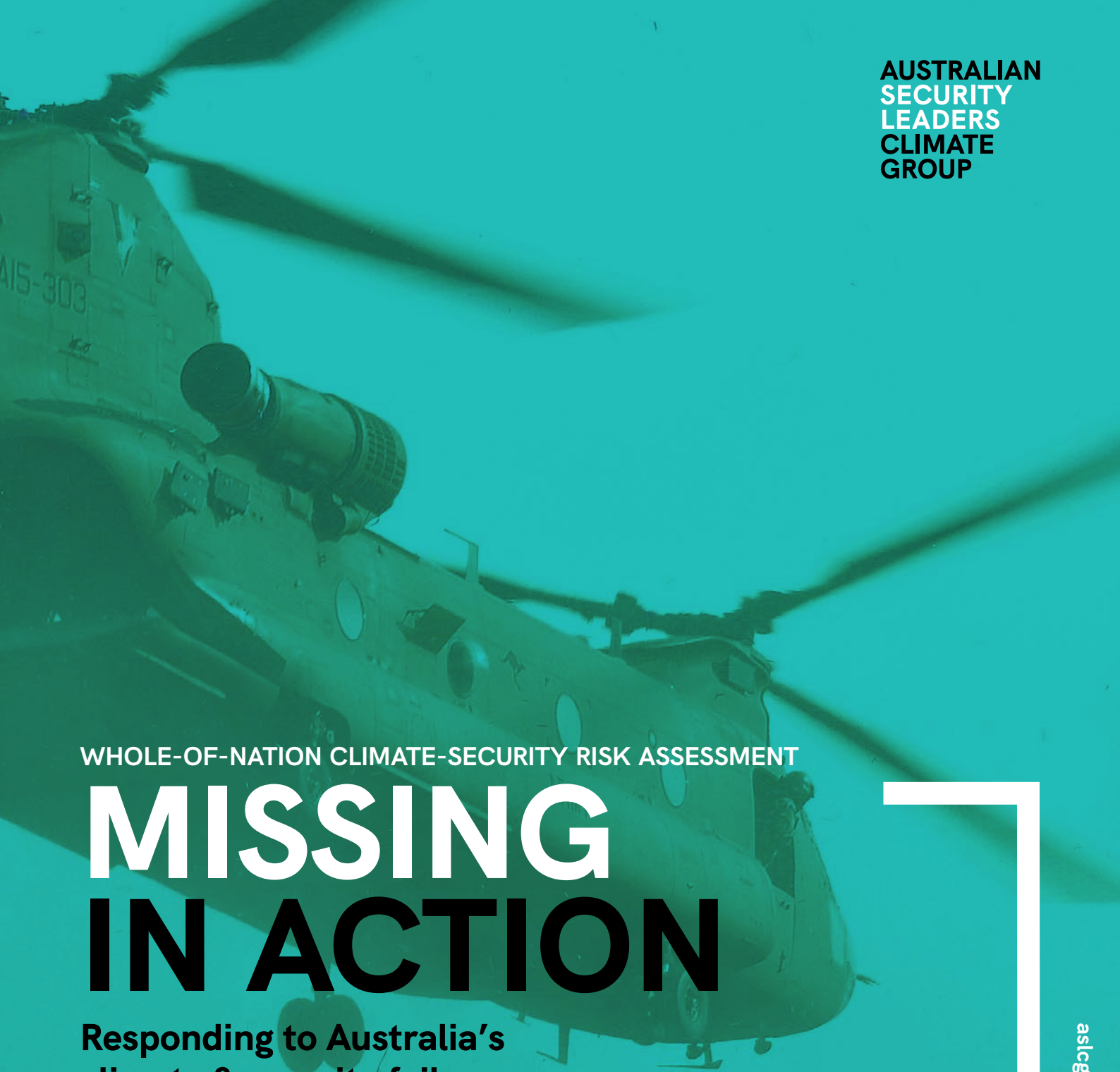

AUSTRALIAN SECURITY LEADERS CLIMATE GROUP

WHOLE-OF-NATION CLIMATE-SECURITY RISK ASSESSMENT

MISSING IN ACTION

Responding to Australia's climate & security failure

aslcg.org

AUSTRALIA HAS REPEATEDLY IGNORED THE RISKS AND IS ILL-PREPARED FOR THE SECURITY IMPLICATIONS OF DEVASTATING CLIMATE IMPACTS AT HOME AND IN THE ASIA-PACIFIC, THE HIGHEST-RISK REGION IN THE WORLD.

Photo: Aerial view of tractor ploughing a paddock affected by drought in the far west of NSW.

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MISSING IN ACTION: RESPONDING TO AUSTRALIA'S CLIMATE & SECURITY FAILURE
Published September 2021 by Australian Security Leaders Climate Group, Canberra ACT.
Admiral Chris Barrie AC (Retd), Air Vice-Marshal John Blackburn AO (Retd), Colonel Neil Greet (Retd), Cheryl Durrant, Major Michael Thomas (Retd) & Ian Dunlop.

Cover Photo: Australian Defence Force helicopter landing as part of the deployment of 3,000 soldiers to assist in bushfire-affected areas after they ravaged the south coast of Australia (January 16, 2020).

Designed by: Aer Design

SNAPSHOT

Climate change now presents a grave, and potentially existential, threat to society and human security.

Today, unimaginable new climate extremes confront us: record-breaking droughts and floods, cruel heatwaves, unstoppable bushfires, broken infrastructure, and coastal inundation. Worse is expected to come.

In vulnerable countries, governments have collapsed and civil wars have erupted, forcefully displacing millions of people looking for a safe haven.

Instability is on the march. A new insecurity shadows our lives and the relations between nations.

Responding adequately to the climate threat is fundamental to the survival of the nation.

But Australia has repeatedly ignored the risks and is ill-prepared for the security implications of devastating climate impacts at home and in the Asia-Pacific, the highest-risk region in the world.

Unless rectified, this will place great pressure on the Australian Defence Force, and emergency and disaster relief agencies, to pick up the pieces in the face of accelerating climate impacts.

Higher levels of warming will stretch them beyond their capacity to respond.

Australia is falling behind its allies, and is failing its responsibilities as a global citizen and its duty to protect its own people.

ASLCG's assessment is that inaction by Australian governments has left the nation poorly prepared to face global warming's consequences. National leadership has been absent and Australia has been "missing in action" on climate-security risks.

Many of the solutions are at our disposal. Australia has the ability to act now, and needs to act now.

Focus should be on the root causes of climate warming, principally eliminating emissions much faster than proposed, rather than just the responding to the symptoms.

In this report, ASLCG propose to the government a set of initial actions in a climate and security plan to Protect, Prevent and Prepare, starting with a realistic assessment of the risks.

PREVENT. PREPARE. PROTECT.

Summary: A Climate-Security Risk Action Plan for Australia

Demonstrate leadership

- **Acknowledge** climate disruption is an existential risk to society, a threat to the stability of nations, and the relationships between them if we act too late, or inadequately.
- **Seize** the initiative by conducting informed, national public conversations and working with all levels of government, communities, business and academia in carrying out regular National Climate Risk Assessments.
- **Show** the Australian people that our leaders care by committing to protecting the Australian people with actionable and credible climate plans to safeguard our future.

Assess climate risks

- **Appoint** an independent, expert panel to urgently conduct a comprehensive Climate and Security Risk Assessment, using the best available information.
- **Establish** an Office of Climate Threat Intelligence.
- **Assess** the threats and impacts of climate disruption with brutal honesty, identifying the worst, as well as most likely, cases and considering the full range of possibilities.

Coordinate and cooperate

- **Coordinate** a holistic, whole-of-government approach, building capacity across the public service and government agencies, and at all levels of government.
- **Cooperate** with big and small Asia-Pacific governments to build alliances for climate action, understanding that cooperation rather than conflict is key to responding to the climate crisis.
- **Build** an Australian National Prevention and Resilience Framework with coherent processes across critical areas including energy and water, logistics, health, industry and agriculture, research and environment.

Act and invest with urgency

- **Protect** the most vulnerable communities, nations and ecological systems.
- **Prevent** devastating climate impacts by mobilising all the resources necessary to reach zero emissions as fast as possible. Cooperate to develop the global capacity to prevent irreversible tipping points and drawdown greenhouse gases back to safer conditions in the long term.
- **Prepare** to manage the risks and respond to the challenges of living in a climate-change-disrupted world with a responsibility to prepare and prevent.

ABOUT THE ASLCG

The ASLCG Executive membership comprises senior leaders with a depth of career experience in defence, national security, policy and risk assessment.

Admiral Chris Barrie AC (Retd) is former Chief of the Defence Force. Chris Barrie retired in 2002 after 42 years in the Royal Australian Navy (RAN). Since then, he has worked on strategic leadership issues as consultant, teacher and mentor at Oxford University, the National Defense University in Washington DC and at the Australian National University.

Air Vice-Marshal John Blackburn AO (Retd) is former Deputy Chief of the Royal Australian Air Force and currently the Chair of the Institute for Integrated Economic Research-Australia and also a consultant in the field of defence and national security. He has extensive experience across the fields of strategy, policy, planning, operational command, capability development and materials acquisition.

Colonel Neil Greet (Retd) is a former Australian Army officer with operational service in Iraq and Timor Leste, who led projects in several remote indigenous communities and played a key role in Defence's response to Victoria's 2009 Black Saturday disaster. He is a Director of the Institute of Integrated Economics Research, and the consultancy Collaborative Outcomes.

Cheryl Durrant is former Director of Preparedness & Mobilisation, Australian Department of Defence, and was the Defence partner with the Australian National Resilience Taskforce's Disaster Vulnerability Profiling Project. Cheryl served 15 years with the Australian Army, specialising in strategic intelligence, information operations and domestic security.

Major Michael Thomas (Retd) a former Australian Army officer and is a non-resident Senior Fellow with the Washington-based Center for Climate & Security where he co-leads the Indo-Pacific Program. He is also a council member with the International Military Council on Climate and Security and author of *The Securitisation of Climate Change* (2017).

Ian Dunlop is a Member of the Club of Rome. He was formerly an international oil, gas and coal industry executive, chair of the Australian Coal Association, CEO of the Australian Institute of Company Directors, and chair of the federal government's first emissions trading taskforce, with wide experienced in risk management.

FOREWORD

Prof. Rear Admiral Neil Morisetti CB RN (Retd)

Wherever we live today, we face many challenges to our prosperity and wellbeing. At the top of the threat list is the impact of a changing climate, whose consequences pose a threat to global and human security that will impact on all of us; there is nowhere to hide!

These risks are now widely recognised by security agencies and governments around the world. Whether it be the immediate impact of harsher and more extreme weather conditions or the onset of long-term trends, including warming and rising sea levels, the results are frequently greater water and food insecurity, or loss of homes and livelihoods. In many instances this results in unplanned movements of populations, or a call for greater disaster relief and humanitarian assistance,

Over the last two years the world has experienced an unparalleled series of climate change-related extreme weather events, including Australia's "black summer" bushfires, which required the mobilisation of military personnel in response. Similarly, wildfires in Europe and North America in 2021, and record-breaking floods are a wake-up call to governments.

There are also geostrategic consequences, as the world has seen in Syria and the Sahel, where movements of population have contributed to greater insecurity. At the same time the rapid warming of the Arctic is changing that region's strategic terrain.

Recent reports from the world's scientists show that some warming impacts will be upon us quicker than previously expected, providing an increased sense of urgency to international policy makers and all nations; the time for talking is over, action is required "this day'".

Addressing these challenges, both in terms of driving down emissions and reducing the risks, is a whole-of-society issue requiring leadership at all levels, particularly by national governments. It sits squarely on their shoulders, and perhaps more so on those of Australia, for not only is the Australian continent particularly vulnerable to climate change, but the country is one of the world's largest fossil fuel exporters.

The 2018 Implications of climate change for Australia's national security report by the Australian Senate concluded that a full assessment of the risks was an urgent task and a strategic priority, if the country was not to continue to lag behind its allies and the global community in responding to climate change. Undertaking a comprehensive climate and security risk assessment is now a critical action if the country is to have a sound national and regional security policy. A security policy that does not reflect the impact of a changing climate is a flawed policy!

The formation of the Australian Security Leaders Climate Group is very welcome, bringing as it does the expertise and understanding of a community with unique security experience to the climate policy table. The Missing in Action report should be read by all politicians, the defence and emergency sectors, and the general public; its policy proposals are a necessary first step in Australia being able to respond appropriately to this twenty-first-century threat.

Professor Rear Admiral Neil Morisetti CB RN (Retd) spent 37 years in the Royal Navy and was Commander UK Maritime Forces before becoming Commandant of the Joint Services Command and Staff College. A former UK Foreign Secretary's Special Representative for Climate Change, he is now Vice Dean (Public Policy) in the Faculty of Engineering Sciences and Professor of Climate, Resource Security at University College London and an International Fellow of ASLCG.

AUSTRALIA: MISSING IN ACTION

We know there is no more important task than understanding and preparing to deal with potential threats to our country and safeguarding peoples' lives. Underestimating security risks can be fatal, not only for military personnel but for the wider community. We saw this during the Black Summer fires that devastated our country.

AT A GLANCE...

- World-leading scientists and analysts and the UN Security Council recognise that climate change poses an existential threat to human civilisation.
- The Pacific Islands Forum has recognised climate change as the single greatest threat to the livelihoods, security and wellbeing of the peoples in the region.
- The USA has made climate change a key security concern and identified it as the top foreign policy priority.
- Whilst the world has recognized the threat and begun to mobilise, in Australia leadership has been lacking. As a result, Australia is "missing in action".
- A 2018 Australian Senate Inquiry noted the failure to adopt a fully integrated approach to climate-security risks and recommended a comprehensive climate and security risk assessment. That is yet to happen.

Photo: Smoke haze from wildfires covers the city skyline in Sydney, Australia. (Brendon Thorne/Bloomberg).

Our assessment is that Australia is ill-prepared to deal with global warming, which is the greatest security threat facing Australia and requires decisive policy action. A UN report has ranked Australia last out of 193 countries for climate action amongst UN members.[1]

That is why we formed the Australian Security Leaders Climate Group as a non-partisan network of Australian security and policy professionals – drawn from all services – with the aim of fostering national discussion and action. Our experience gives us unique insights into Australia's lack of preparedness in facing existential climate risk. ASLCG's aim is not to securitise climate change, but to apply military prevention, preparedness and leadership practice to the climate challenge. Eliminating carbon emissions as rapidly as possible is an essential step in reducing the security risks of climate change.

Australians, concerned about the future, their livelihoods, their well-being and those they love, want to live in a prosperous and safe society. It is the first duty of a government to make this happen, to "protect the people". But when it comes to climate change, governments from both sides of politics have failed in this duty to ensure Australians' future.

Australia can take a lead from our allies. Hosting a climate and security panel on 22 April 2021, as part of US President Biden's Leaders Summit on Climate, US Secretary of Defence Lloyd J. Austin III commenced with these words: "Today, no nation can find lasting security without addressing the climate crisis. We face all kinds of threats in our line of work, but few of them truly deserve to be called existential. The climate crisis does."[2]

The evidence is clear. Policies enacted as a result of national emission-reduction commitments under the *Paris Agreement* will result in climate warming of around 3°C by 2100,[3] and perhaps 4°C or more when non-linear changes are taken into account. In 2020, the International Monetary Fund (IMF) reported that: "Under unchanged policies, emissions will continue to rise relentlessly, and global temperatures could increase by an additional 2–5°C by the end of this century… increasing the risk of catastrophic outcomes across the planet."[4]

The impacts of 3°C of warming will likely be existential for some nations and peoples. Existential risk is understood as an adverse outcome that could curtail sustainable development and threaten the very sovereign existence of communities and states alike. All current members of the UN Security Council recognise that climate change poses an existential threat to human civilisation.[5]

A 2018 Australian Senate Inquiry found climate change is "a current and existential national security risk".[6] It recognised that Australia and its neighbours are in the region most exposed to climate impacts, and that climate change is: threatening the health of Australians, their communities, businesses and the economy; heightening the severity of natural hazards; increasing the spread of infectious diseases; and creating growing water insecurity threats to agriculture. It also noted the failure so far to adopt a fully-integrated, whole-of-government approach to climate–security risks. Whilst it prompted some low-level response, there was no substantial policy response from the government.

All members of the Pacific Islands Forum, including Australia, supported the 2018 Boe Declaration at which all Forum leaders "reaffirm 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".[7]

Climate impacts will have big consequences for human security for our Pacific and Asian neighbours. They are already facing chronic water shortages that will get worse, threats to low-lying cities and island states, extended and more intense heat waves, more damaging typhoons, and much more.

These threats will also impact Australia in many new ways: disruptions to vital imports and our export markets as production fails and supply chains are interrupted, and breakdowns in social cohesion and state failure in the region.

In Australia, policymakers, defence mandarins and security analysts have by-and-large focused on traditional but narrow security concepts and downplayed or ignored the issue of climate disruption and human security. But climate change requires different thinking about security, so that it is not seen as only about defence from armed attacks, but rather needs to involve all levels of government, as well as relevant industry sectors and the wider society.

Climate is also an urgent strategic priority. Australia is falling behind its allies, and is failing in its responsibilities as a global citizen, as a major strategic defence ally, and to its own people.

In the past decade, no Australian government has produced a dedicated assessment of climate and security risks. The 2016 Defence White Paper had several mentions of climate issues — mainly in relation to the Pacific and state fragility, disaster relief and vulnerability of defence assets — but accorded them no strategic significance. And the 2015 National Climate Resilience and Adaptation Strategy's cursory focus on regional issues was largely confined to the Pacific, adaptation measures and disaster risk. In neither case has there been any significant policy follow-up concomitant with the full spectrum of climate-security risks.

By way of contrast, US President Biden's "Tackling the climate crisis at home and abroad" Executive Order put the climate crisis "at the center of US foreign policy and national security" and directs the Secretary of Defense, the Director of National Intelligence and others to analyse the security implications of climate change and incorporate them into modeling, simulation, war-gaming and other analyses.[8]

We are on the front-line of climate-driven security threats, but Australia's last national security risk assessment was conducted in 2013, and it has been more than three years since the Final Report of the Senate Inquiry into the Security Implications of Climate Change recommended a comprehensive climate and security risk assessment. Australian governments, up until now, have not undertaken such a task, which is now necessary and overdue.

Within the Department of Defence (DoD), some steady, but limited, work has been done on the vulnerability of assets to inundation, extreme heat and bushfire, and the resilience of equipment and the health of personnel to more extreme climate conditions. As a highly political issue, engagement within the DoD has been difficult, with little expertise and interdisciplinary skill-sets to fully grasp the challenges.

Amongst the intelligence agencies there is little evidence that climate and security issues have received the strategic priority they need. Some work has focussed on tactical issues around climate diplomacy, Indian Ocean analysis prompted by the French government, and some activity related to the Senate inquiry. The government appeared unprepared for the diplomatic fallout in the Pacific created by Australia's pro-coal climate policies, and the belated understanding of Chinese initiatives in the region led to some catch-up analysis on climate and security issues amongst near neighbours and in the Pacific.

There have been concerning signs that the existential nature of climate-security risk is not grasped. Speaking in April 2019 on the ABC, Nick Warner, then Director-General of the Office of National Intelligence, did not include climate amongst Australia's biggest threats, in sharp contrast to surveys by the World Economic Forum of global public and private sector leaders, which rank climate in the top global threats and risks.

Warner emphasised that intelligence "doesn't look at worst-case scenarios… If you go around putting forth worst-case scenarios all the time you will alarm and probably alarm needlessly so that is exactly what we don't do."[9] It is unclear whether this represents the prevailing view. Understanding the worst-case is precisely what our intelligence agencies need to do. In the climate context, it is the high-impact "fat-tail" outcomes that we have to guard against.

The capacity of the Australian Public Service (APS) to provide advice on climate issues has been diminished. This was one reason why the government was caught unprepared by the depth and extent of the 2017-19 drought across eastern Australia, which resulted in a scramble within the APS to play policy catch-up. Likewise for the Pacific.

Due to the highly politicised nature of climate change, the APS has struggled to find its voice on credible policy suggestions. A high-level departmental head group on systemic climate risks fell into dormancy. Former APS personnel report experiences in which initiating new work on climate change could not be overtly identified as climate focussed because that may lead to the project being closed down. It is important for the APS to reestablish a "frank and fearless" voice on climate policy choices.

Australia has a record of being ill-prepared at a national level for predictable climate threats such as extreme bushfire seasons and heatwaves, extreme drought and the water crisis in the Murray-Darling Basin, increasing aridification and loss of reliable croplands, and coastal inundation.

There is no evidence that there has been a systematic analysis of how severe climate disruption across the Asia-Pacific could impact supply chains and the Australian economy, for example.

This is one clear case, amongst many, that Australia is "missing in action" on this most fundamental issue.

THE CLIMATE-SECURITY NEXUS

AT A GLANCE

- Recent events in Syria and across the Sahel demonstrate that the security consequences of climate change are already manifesting.
- Interactions between intersecting crises such as food and water insecurity and fragile states can become accelerants to instability in unexpected ways.
- By 2030, the world could face a perfect storm of food, water and energy crises.
- Australia and the Asia-Pacific, with more than half of the world's population, are located in a "disaster alley" for climate change.
- Climate change poses an increasing threat to peace, can undermine livelihoods, increase involuntary migration and reduce the ability of states to provide security.

In 2010, an extreme heatwave, lack of rain and unprecedented wildfires devastated more than a third of cultivable land in Russia, the world's fourth largest grain exporter, and reduced wheat production by 30%. In response, the Russian government banned wheat exports for several months. At the same time, severe droughts in China and the Ukraine contributed to a global wheat shortage and a doubling of the global price in late 2010. In those countries most dependent on wheat exports — which are in the Middle East and North Africa — the tripling of the spot price triggered food riots and the Arab Spring uprisings in late 2010.

The Middle East, North Africa and Mediterranean regions have experienced a drying trend over the last few decades. 60% of Syria saw the worst long-term drought in millenia from 2007-11, and severe crop failures. By 2009, more than 800,000 Syrians in rural areas had lost their livelihood, and 2-3 million people had been driven into extreme poverty. Approximately 1.5 million people migrated to the cities which, on top of another 1.5 million refugees who had fled from the war in Iraq, forced up rents dramatically and created social unrest. Facing a food and economic crisis, and government reductions in subsidies for basic goods, Syrians erupted in protest in early 2011, inspired by the Arab Spring. What followed was social breakdown, state failure, civil war and the rise of Islamic State. After ten years, Syria remains the world's largest refugee crisis with more than half of the population displaced. Whilst the region may have suffered political upheaval without the drought, it is the congruence of climate change and social vulnerability that has caused a greater disaster.

The wider consequences of the Syrian war included regional destabilisation, and mass migration which contributed to the rise of populist right-wing governments in Europe, and impacted on the Brexit referendum in which almost three-quarters of prospective "Leave " voters cited immigration as the most important issue in the referendum.[10]

The Arab Spring, the Syrian war and Europe's refugee dilemmas are key examples of how reciprocal interactions between intersecting crises become accelerant to instability in unexpected ways. There are climate change components to the conflicts in many countries across the Maghreb and the Middle East, and the role of desertification in fueling war and displacement across the Sahel.

These events vividly illustrate the climate and security nexus. Climate change, drought and desertification can worsen water insecurity and trigger food crises, resulting in humanitarian disasters, instability and civil unrest, forced migration and internal displacement, and war within and across borders. There are increasing burdens on military forces, whether in providing disaster relief and humanitarian assistance, or because political leaders decide to intervene in the conflicts. Such events may lead to geopolitical tensions and realignment, such as the changed tone of Middle East politics following Russia's intervention in Syria.

Former Director of War Studies for the Australian Army, Dr Albert Palazzo says that human systems — especially for food and water — depend on efficient interactions with natural systems, and climate change renders natural systems less predictable and makes human systems less efficient. This imperils the capacity of the state to fulfil its obligations — especially its social contract to protect the people — as the efficiency of production declines and disorder increases.

A report for the UK Ministry of Defence published in November 2019, *A Changing Climate: Exploring the Implications of Climate Change for UK Defence and Security*, uses a scenario with a 3.5°C temperature rise by 2100 to forecast climate change implications for the military. It says that as early as 2030, the world would face a perfect storm of food, water and energy crises: "The demand for food and energy is estimated to rise by 50% by 2030, while water demand has been projected to increase by 30 percent" so that "in regions where food shortages are combined with poor governance, climate change could contribute to civilian protests, rioting and an increased likelihood of violent conflict."[11]

Climate change and extreme climate events may impact human security in many other ways, including resource competition (for example over water) and increased rivalry between states, unmanageable health emergencies and pandemic spread, rising sea-levels inundating infrastructure and fertile farming land, and economic and trade disruptions and supply chain degradation.

Climate change poses an increasing threat to peace, can undermine livelihoods, increase involuntary migration and reduce the ability of states to provide security. It can amplify existing vulnerabilities, especially where there is existing conflict and weak or failing governments, thus exacerbating or "multiplying" the negative effects of other drivers of change, and disproportionately affecting the more vulnerable.

Australia and the Asia-Pacific region are a "disaster alley" for climate change, with more than half the world's population, low-lying small island states, and most of the large cities vulnerable to sea-level rise. Nations in the Coral Triangle face the loss of their coral systems, the region's most populous nations — India and China — will face increasing chronic water insecurity, and more extreme heatwaves will become unbearable in south and south-east Asia.

The consequences for Australia will be enormous: displaced people and nations, the economic impacts on major trading partners, supply chain disruption, geopolitical tensions (along the Himalayas as one example), the need for more development support, and increasing demands for humanitarian aid and disaster relief.

There will be increasing calls on the military for support and humanitarian aid, including in their own countries, such as that required in response to the record-breaking "black summer" bushfires in Australia in 2019-20. Armed forces have, and will continue to, adapt to this changing environment, and consider climate change impacts on infrastructure, installations, equipment and the capacity of personnel to operate in more extreme climate conditions. The failure to address the root causes of climate warming will result in great pressure on the Australian Defence Force and emergency and disaster relief agencies to pick up the pieces in the face of accelerating climate impacts. Higher levels of warming may stretch them beyond their capacity to respond.

The Australian Chief of Defence Forces, General Angus Campbell, has 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.[12]

INSIGHT

A global climate & security approach

By Cheryl Durrant, former Director of Preparedness & Mobilisation, Australian Department of Defence

Security, as the duty of a government to "protect the people" is often perceived in national and military terms. But today the greatest risks to human society are existential and global: such as biotechnology, artificial intelligence and technological disruption, and environmental risks.[13]

Responding successfully to these risks requires global cooperation and collaboration.

Placing primary emphasis on fragmentary national responses is misplaced. This is a lesson that may be learned from the Covid-19 responses, and from Syria, where climate disruption exacerbated the conflict and fragmented responses in Europe threatened regional cooperation.

Building on concepts of human security, new global security approaches frame risk at a planetary level and include risks to species and the environment, between humans and the ability of the environment to support us, between humans and pathogens as well as the risks to orderly relations between peoples and nations. Emphasis shifts from response to prepare and prevent.

A global security perspective can open the door to participation for a far wider group of people, increasingly dissolving the boundaries between "domestic" and "international" affairs and policies.[14]

By moving from the limited focus of national security to also include concrete human and global notions of security and safety, a narrative can be constructed that is more nuanced than a traditional security agenda, as is discussed in the recent UN Security Council report on the issue.[15]

Photo: The UN Security Council, New York. (TIMOTHY A. CLARY/AFP via Getty Images)

CASE STUDY

The looming food & water crisis

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

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.[16] In 2010, almost 2.4 billion people were living in watersheds with less than 1000 cubic metres per capita per year (defined as chronic water shortage); and approximately 800 million people were living in watersheds with less than 500 cubic metres per capita per year (extreme water shortage).[17]

Today, approximately 1.8 billion people around the world lack access to safe drinking water and nearly two billion people lack access to sanitation.

By 2035, "more than 30 countries — nearly half of them in the Middle East — will experience extremely high water stress, increasing economic, social, and political tensions".[18] 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. By 2030, population growth and a burgeoning global middle class will result in a worldwide demand for 35% more food and 50% more energy, compared to 2014.[19]

Scientists project the subtropical zone will experience a 5-10% reduction in precipitation for each degree Celsius of global warming. At 3°C of warming, water availability will decrease sharply in the dry tropics and subtropics, affecting about two billion people worldwide, and agriculture may become nonviable in the dry subtropics.

India's national water supply is forecast to fall 50% below demand as early as 2030.[20] A World Bank report on China's water situation foresees "catastrophic consequences for future generations,[21] unless water use and supply can quickly be brought back into balance. Pakistan will face severe water scarcity by 2025 and is "one of the most water-stressed countries in the world".[22] In the Middle East and North Africa, drought is leading to instability and water weaponization.[23]

Water insecurity is not the only threat to food production: compounding and cascading impacts of climate change will undermine food security on an increasing scale. These include the loss of corals and fish stocks in the Coral Triangle, coastal inundation and more extreme floods, changed precipitation patterns, droughts and aridification, and fires. Even without accounting for all these simultaneous hazards, scientists say that 2°C of warming around 2040 in Southeast Asia will reduce per capita crop production by one-third.[24]

And scientists now believe that for every degree of additional warming, average agricultural yields are likely to decline by up to 10 per cent; as well as higher concentrations of CO2 in the atmosphere already having a serious effect on the nutritional quality of most of the world's major crops - grains, soya, corn and rice. [25]

Photo: Hagadera Refugee Camp south of Dadaab, Kenya as severe drought continues to ravage East Africa.

RISING GREENHOUSE GASES WILL RESULT IN A MORE FRAGMENTED, UNSTABLE AND DANGEROUS WORLD, BUT THE TRADITIONAL SECURITY ESTABLISHMENT HAS BEEN UNWILLING TO GRASP THE FUNDAMENTAL NATURE OF THE THREATS POSED BY CLIMATE CHANGE.

CLIMATE-SECURITY PHYSICAL RISKS

The social, economic, political and security consequences of climate warming are driven by physical changes in the Earth's climate system. Understanding those changes, and particularly the worst-case scenarios, is the key starting point for analysing climate-security risks.

AT A GLANCE

- Global warming is now 1.2°C, likely to reach 1.5°C around 2030 and 2°C before 2050 on the higher emissions trajectories.
- Climate change is already dangerous, with tipping points likely passed for large-scale systems such as coral reefs, Arctic sea ice and West Antarctica; other tipping points are dangerously close.
- Even well below 2°C there is a significant risk of triggering cascading climate tipping points, in which passing one tipping threshold will trigger further threshold events.
- Sea-level rise takes place over many centuries and will likely exceed more than one metre this century. US government agencies have a high scenario of 2.5 metres by 2100.

Photo: Australian Army Blackhawk helicopter flies over flooded Fitzroy River in Rockhampton after a paralyzing deluge (January 8, 2011).

Current warming and projections

- The global average warming trend is now above 1.2°C, compared to the late nineteenth century, and accelerating.
- Warming is projected to:
  - reach 1.5°C around 2030;
  - reach 2°C before 2050 for both the higher emission scenarios; and
  - reach 3°C around 2060 for the current, high-emissions scenario.[26]
- These results are based on models that do not include the full range of amplifying system feedbacks.

Dangerous climate change

- At just 1.2°C of warming, climate disruption is already dangerous, with tipping points very likely already passed for large-scale systems including coral reefs, Arctic sea-ice[27] and West Antarctic Ice Sheet glaciers.[28] Parts of East Antarctica might be similarly unstable.[29] One-quarter of the Himalayan and Tien Shan ice sheets have already been lost.[30]
- There is debate about whether the Amazon rainforest is also close to tipping,[31] and strong evidence that before or around 1.5°C the Greenland ice sheet will reach its tipping threshold.[32]
- Around 2030 and with warming at 1.5°C, there is a risk of blue-water Arctic summers[33] as sea-ice extent collapses and regional warming is amplified to be three times the rate of the global average. The risk will grow substantially that Arctic carbon stores including permafrost[34] and boreal forests will suffer substantial, accelerating and unstoppable carbon losses.[35]

Sea levels

- On average, sea-levels rise 10 to 20 metres for each 1°C of climate warming. The polar ice sheets have great thermal inertia, so this takes place over many centuries to millenia. The last time there were no polar ice caps, 36-40 million years ago, the temperature was around 3-4°C warmer and sea levels were 70 metres higher than at present.[36]
- In past climates, with atmospheric carbon dioxide levels similar to today, sea levels were around 25 metres higher than at present.[37]
- The US Army Corps of Engineers, for planning purposes, uses sea-level rise scenarios of one and two metres by 2100, whilst other US agencies have a high scenario of 2.5 metres.[38]

Tipping points

— Tipping points for major climate systems may occur as global heating pushes temperatures beyond a critical threshold, leading to accelerated and irreversible impacts. Interactions between these climate systems could lower the critical temperature thresholds at which each tipping point is passed.

— In some cases, passing one threshold will trigger further threshold events, for example, where substantial greenhouse gas releases from polar permafrost carbon stores increase warming, releasing even more permafrost carbon in a positive feedback, but also pushing other systems, such as polar ice sheets, past their threshold point.

— In 2018, scientists proposed a "Hothouse Earth" scenario in which non-linear system feedbacks and their mutual interaction cascade to drive Earth's climate to a "point of no return", whereby further warming would become self-sustaining, that is, without further human emissions.[39] This, they said, could be triggered at 2°C, perhaps even lower.

— Even well below 2°C and aiming for 1.5°C of global warming — in the *Paris Agreement* target range — there is a significant risk of triggering further cascading climate tipping points. In a study released in June 2021 explicitly looking at the physical interactions among the Greenland and West Antarctic ice sheets, the Atlantic Meridional Overturning Circulation and the Amazon rainforest, analysts found that the polar sheets are often the initiators of cascade events, with Greenland and West Antarctica at risk of passing their tipping points within the 1.5°C-2°C Paris range.[40]

Earth system tipping points

A Arctic sea ice

Arctic sea ice is in a death spiral: "The trend is clear: Summer ice covers half the area it did in the 1980s, and because it is thinner, its volume is down 75%" (Voosen, P 2020, Science, 25 August). "The Arctic is currently experiencing an abrupt climate change event… climate models underestimate this ongoing warming" (Jansen, E et al. 2020, Nature Climate Change, 10:714-721).

B Greenland Ice Sheet

The Greenland Ice Sheet is already close to a tipping point, previously estimated to be around 1.6°C (Robinson, A et al. 2012, Nature Climate Change, 2:429-432). Some researchers say it has already passed a tipping point (Arenschield, A 2020, phys.org, 13 August).

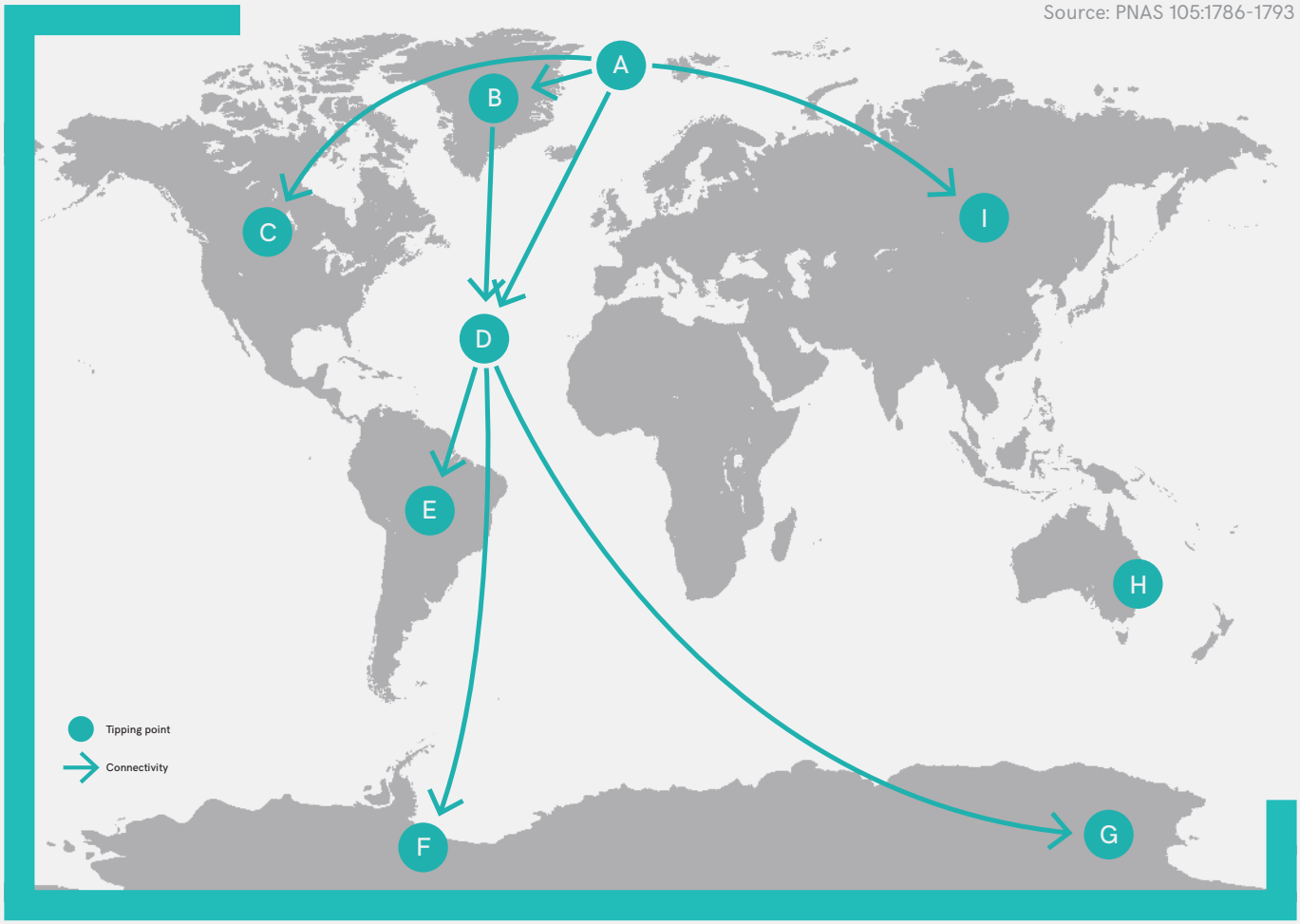
C Boreal forest

Increasing wildfires and dieback threaten the historic carbon sink of the North American boreal forests. As fires continue to increase in size, frequency and intensity, the area of young forests that experience combustion will likely increase and have a key role in shifting the boreal carbon balance (Walker, XJ et al. 2019, Nature 572:520-523).

D Atlantic circulation

The Atlantic Meridional Overturning Circulation (AMOC) has slowed 15% since the mid-20th century (Caesar, L et al. 2018, Nature 556:91-196), and the rate of change is accelerating. The near-term loss of summer Arctic sea ice will drive an accelerating rate of ice mass loss from Greenland, and contribute to a further slowdown of AMOC.

Source: PNAS 105:1786-1793



E Amazon rainforest

The forest systems are already oscillating to non-forest ecosystems in eastern, southern & central Amazonia (Lovejoy, TE et al. 2018, Science Advances, 4:eaat2340.) The Amazon is near the tipping point of switching from rainforest to savannah (Harvey, F 2020, The Guardian, 5 October).

F West Antarctic Ice Sheet

The Amundsen Sea sector of the West Antarctic Ice Sheet (WAIS) has most likely been destabilized and ice retreat is unstoppable for the current conditions. No further acceleration in climate change is necessary to trigger the collapse of the rest of the WAIS on decadal time scales (Rignot, E et al. 2014, Geophys. Res. Lett. 41:3502-3509).

G Wilkes Basin, East Antarctica

Partial deglaciation of the East Antarctic Ice Sheet (EAIS) is likely for the current level of atmospheric carbon dioxide (DeConto, RM et al. 2016, Nature 531:591-597). Parts of East Antarctica might be similarly unstable to West Antarctica (Lenton, TM et al. 2020, Nature 575:592-595).

H Coral systems

Coral systems are in a death spiral of more frequent bleaching and inadequate recovery time. Three-quarters of the Great Barrier Reef has already been lost, and at 1.5°C the reef is likely to bleach two years in every three on average (King, AD et al. 2017, Nature Climate Change, 7:412-416), whereas recovery takes a decade or more.

I Permafrost

Some scientists consider that 1.5°C appears to be something of a "tipping point" for extensive permafrost thaw (Vaks, A. et al. 2013, Science, 340:183-186). The 2019 Arctic Report Card concludes permafrost ecosystems could already be releasing as much as 1.1 to 2.2 billion tons of CO_2 per year.

Photo: Army vehicles enter Townsville to help evacuate flood-affected people from Townsville (February 4, 2019).

Risk of losing control

- In a 2019 followup to the "Hothouse Earth" analysis, researchers said that: "The evidence from tipping points alone suggests that we are in a state of planetary emergency: both the risk and urgency of the situation are acute… If damaging tipping cascades can occur and a global tipping point cannot be ruled out, then this is an existential threat to civilization. No amount of economic cost-benefit analysis is going to help us… we might already have lost control of whether tipping happens."[41]
- The evidence points to the Hothouse Earth scenario being active by the time the world hits 3°C. This is likely to be a state where humanity may have lost control of whether more tipping points are reached, though many of them may well have been activated by this point. The Arctic could become a vessel of greenhouse gases pouring from permafrost, boreal forests and possibly sub-sea methane clathrate stores.
- Climate dynamics on the journey to 3°C or more of warming will be significantly shaped by non-linear processes and sudden changes, pushing many large elements of the climate system from one discrete state to another, and cascades of system-level changes.

Impacts in 2020…[42]

- Severe flooding hit large parts of Africa and Asia, helping trigger a locust plague in the Horn of Africa, which occurred after several years of drought affecting food security among local communities, causing local food riots in the midst of the pandemic.
- Extreme drought affected many parts of South America, with estimated farming losses nearing $3 billion in Brazil alone, and further losses in Argentina, Uruguay and Paraguay.
- The largest wildfires ever recorded burned in forests of North America and Southeast Australia, some with such fierce power that they were comparable to a moderate volcanic eruption.
- Record temperatures over 30–35°C were observed both in the Siberian and European Arctic.
- Cyclone Amphan hit India and Bangladesh and was the costliest tropical cyclone on record for the North Indian Ocean, while Typhoon Goni, which crossed the Philippines, was one of the most intense cyclones ever to hit land.

CASE STUDY

The disrupted world at 3°C

On a high-emissions trajectory, global average warming will reach 3°C around 2060. In this world, the poorest nations will suffer first and most deeply from climate change, but no region will escape. 3°C would be "catastrophic" for the world's poorest three billion people, mostly subsistence farmers, whose livelihood will be severely impacted, if not destroyed, by megadroughts, heat waves, or heavy floods.[43]

The structures of societies will be severely tested, and some will crash, with a study by two US national security think-tanks concluding that 3°C of warming and a 0.5 metre sea-level rise would likely lead to "outright chaos" and "nuclear war is possible".[44]

At 3°C, water availability will decrease sharply in the lower-latitude dry tropics and subtropics, and affect almost two billion people worldwide. Agriculture will become nonviable in the dry subtropics.[45] Southern Europe would be in permanent drought, and the Sahara will jump the Mediterranean as Europeans begin a long trek north. Water flows into the great rivers of Asia will be reduced by the loss of more than one-half, and perhaps much more, of the Himalayan ice sheet. The average drought in Central America would last 19 months longer. In northern Africa, the figure is 60 months longer: five years.[46]

Aridification will emerge over more than 30% of the world's land surface,[47] most severely in southern Africa, the southern Mediterranean, west Asia, the Middle East, rural Australia and across the south-western United States.

Most regions in the world will experience a significant drop in food production and increasing numbers of extreme weather events, including heat waves, floods and storms. Food production will be inadequate to feed the global population and food prices will skyrocket, as a consequence of a one-fifth decline in crop yields, a decline in the nutritional content of food crops, a catastrophic decline in insect populations, aridification, monsoon failure and chronic water shortages, and conditions too hot for human summer habitation in significant food-growing regions.[48]

The lower reaches of the agriculturally-important river deltas such as the Mekong, Ganges and Nile will be inundated, and significant sectors of some of the world's most populous cities — including Kolkata, Mumbai, Jakarta, Guangzhou, Tianjin, Hong Kong, Ho Chi Minh City, Shanghai, Lagos, Bangkok and Miami — inundated and/or abandoned.[49]

Deadly heat conditions will persist for more than 100 days per year in West Africa, Central America, the Middle East and South-East Asia, which together with land degradation, aridification, conflicts over land and water, and rising sea levels will contribute to up to a billion people being displaced. Refugee conventions may give way to walls and blockades.[50]

AUSTRALIA'S CLIMATE VULNERABILITY

AT A GLANCE

- Australia is already hot and dry and the most vulnerable continent to climate change.
- Catastrophic wildfires are having increasingly dire effects on the landscape and contributing to ecosystem collapse in World Heritage areas.
- Most of Australia can expect extreme summer temperatures of more than 50°C by century's end.
- Australia's supply chains and trading relationships are precarious, being a geographical distant island in a hyper-connected global economy.
- Climate impacts on agriculture have the potential to significantly threaten food production in Australia.

Countries in the southern hemisphere subtropics, such as Australia, are projected to experience the largest impacts on economic growth due to climate change.[51] Australia is already hot and dry and the most vulnerable continent.

Coral systems are healthy only when warming is less than half a degree Celsius.[52] With warming now 1.2°C, the Great Barrier Reef's extent has been reduced to one-fifth of its area 50 years ago. When warming reaches 1.5°C, ocean heatwaves similar to those that caused severe bleaching in 2016 are likely to occur two in every three years,[53] but corals take more than a decade to recover. This is a death cycle; the reef as an ecosystem will likely be lost by 2030.

After the 2016 Tasmanian World Heritage bushfires, fire ecologist David Bowman declared "this is system collapse".[54] Seven years earlier, just after the Black Saturday, Prof. David Karoly told a European conference "We are unleashing hell on Australia", with catastrophic wildfires ravaging the landscape.[55]

Yet in 2019, the Federal Government refused to meet with retired senior firefighters who were ringing alarm bells. For eighteen months, a draft national government plan to respond to the increasingly dire effects of fires and other natural disasters lay gathering dust in Canberra.

2019 was the hottest and driest on record in Australia. New South Wales experienced the state's driest soil conditions on record, with farms devoid of stock, temperatures too hot for cattle to breed and coastal rivers not flowing.

Climate warming is creating a longer fire season with more extreme fire danger days. The unprecedented 2019-20 summer bushfire storm killed or displaced three billion animals and 85,000 square kilometers of forest was lost. The fires were worse than the high-end projections of fire impacts in 2100. Like the Great Barrier Reef, those forest ecologies are likely in a death cycle: climate and fire conditions similar to 2019 are likely to occur more often than the time it takes the forests to recover. Those bushfires witnessed the largest domestic military mobilisation in Australia's history of some 6,500 soldiers.

The fires also exposed infrastructure's climate vulnerability, with some fire-ravaged regional areas losing all telecommunications capacity, water and electricity utilities, banking services, and logistical land access for relief services and food supplies; in some cases for months.

Australia's supply chains are precarious, being a geographically distant island in a hyper-connected global economy. In an emergency where supply chains are disrupted, domestic oil and petrol supplies would last only weeks, and military capacity to move and fly would be compromised. The initial months of Covid-19 found Australia's national emergency health stockpile virtually empty, with the nation's pandemic response undermined by an incapacity to source sufficient supplies of basics such as PPE.

The loss of wealth from climate change impacts on agriculture and labour productivity may reach $A4.2 trillion by 2100 under a business-as-usual scenario.[56] Over coming decades, agriculture production is expected to decline, with major export commodities including wheat, beef, dairy and sugar projected to fall 9–10% by 2030 and 13–19% by 2050. Overall declines of agriculture exports of 11–63% by 2030 and 15–79% by 2050 depend on the level of adaptation and warming.[57]

The Murray-Darling Basin accounts for approximately half of Australia's irrigated agricultural production. Prof. Ross Garnaut warned of the Basin's likely fate more than a decade ago: on the current high-emissions trajectory, irrigated agriculture output in the Basin would halve by 2050. And it would end by 2100, accompanied by a 40% drop in pasture productivity in south-eastern Australia.[58]

In fact, the reality is worse than the projections. CSIRO data shows that annual Basin inflows have almost halved over the last 20 years.[59]

The Paris goal is to hold warming to 1.5–2°C, but current policy commitments by nations are on a warming path of 3°C and more, once system feedbacks are included. At 4°C of warming, annual rainfall in southern Australia falls by half, particularly in winter and spring. The Australian wheat industry is highly sensitive to climatic influences. In Garnaut's hot, dry scenario, wheat yields fall to zero in many regions.[60]

There is also strong evidence to suggest that climate change will impact the quality as well as quantity of food produced. The nutritional content of major food crops such as potatoes, wheat, corn, soybean and rice is likely to lower with increased atmospheric CO_2, potentially leading to deficiencies in iron, zinc and protein.[61]

Climate impacts on agriculture have the potential to significantly threaten food security in Australia, particularly through the consequences of reduced yields. Globalisation exposes food supply systems in Australia to rising resource prices and increases in global demand, compounding challenges associated with economic and population growth, biodiversity and climate change impacts and increasing resource competition for land and water.[62]

Most of Australia can expect extreme temperatures of more than 50°C by century's end. Global warming of 2°C implies an average 3°C warming over land, 4-5°C in the regions that are drying, 5-6°C in summer average temperatures in dry regions, and 6-8°C hotter for individual days during heatwave conditions in dry regions such as Australia.

Marine and land heatwaves will become more frequent and intense, and thunderstorms will dump more rain and worsen floods as the globe heats up.

Residential and commercial buildings are highly vulnerable to climate change impacts, particularly in coastal areas, where development is concentrated. Future losses in residential property values may total $A571 billion by 2030, $A611 billion by 2050 and $A770 billion by 2100, concentrated on 5-6% of properties.[63] The costs of extreme weather are projected to rise to $A91 billion per year annually by 2050 and $A117 billion per year by 2100.[64]

The Australian Strategic Policy Institute (ASPI) reports that: "Australians are already exposed to a broad range of the hazards that climate change is amplifying. Twenty per cent of our national GDP and 3.9 million of our people are in areas with high to extreme risk of tropical cyclones, and about 11% of GDP and 2.2 million people are in places with high and extreme risk of bushfire."[65]

A sea level rise of 1.1 metres could place $A266 billion of emergency services infrastructure at risk, including 258 police, fire and ambulance stations as well as 75 hospitals and health services.[66] An increased burden on health services is expected due to extensive health challenges that are forecast with various climate impacts, compounded by existing public health issues and an ageing population.

AUSTRALIA IS A GEOGRAPHICALLY DISTANT ISLAND IN A HYPER-CONNECTED GLOBAL ECONOMY, MAKING ITS SUPPLY CHAINS PRECARIOUS. IN AN EMERGENCY WHERE SUPPLY CHAINS ARE DISRUPTED, DOMESTIC OIL SUPPLIES WOULD LAST ONLY WEEKS, AND MILITARY CAPACITY TO MOVE AND FLY WOULD BE COMPROMISED.

Photo: Devastating floods inundated Brisbane city, Australia, 2011.

MANAGING EXISTENTIAL CLIMATE RISK

AT A GLANCE

- The world is currently heading towards levels of warming with impacts that will be catastrophic.
- Forecast levels of warming will make some nations and regions unliveable with the world's poorest facing an existential threat if they do not relocate or migrate.
- Existential climate risk requires a prudent, precautionary risk-management approach with attention given to the "fat-tail", high-end possibilities whose consequences would be devastating for human society.
- There is a fragility at the highest levels of corporate and public service leaderships with their ability to spot, identify and handle unexpected non-normative events perilously inadequate.
- Successful risk management requires thinking "outside the box", rather than in silos, to avoid a failure of imagination.

The world is currently heading to 3-4°C of warming. Prof. Kevin Anderson, Professor of Energy and Climate Change in the School of Mechanical, Aerospace and Civil Engineering at the University of Manchester, says that a 4°C future "is incompatible with an organised global community, is likely to be beyond 'adaptation', is devastating to the majority of ecosystems and has a high probability of not being stable".[67] The World Bank has warned that "there is no certainty that adaptation to a 4°C world is possible".[68] Amongst other impacts, 4°C would in the long run melt both polar ice caps, with a sea-level rise of around 70 metres.

3°C of warming would be catastrophic and make some nations, and regions, unliveable. Researchers looking at existential climate risks propose a "dangerous" risk category of warming greater than 1.5°C, and a "catastrophic" category for warming of 3°C or more.[69] They describe the impacts of 3°C of warming on the world's poorest: "This bottom three billion population comprises mostly subsistence farmers, whose livelihood will be severely impacted, if not destroyed, with a one- to five-year megadrought, heat waves, or heavy floods; for those among the bottom three billion of the world's population who are living in coastal areas, a 1- to 2-metre rise in sea level poses an existential threat if they do not relocate or migrate."[70]

There is now broad recognition that climate risks are existential: from the UN Secretary-General to the US Secretary for Defense, across the scientific community, and in the Australian Senate's report into climate and security risk. The seriousness of the threat was also emphasised by the latest report from the IPCC.

When such threats exist to the very foundation of modern human societies and the complex and fragile globalised network within which they co-exist, the normal approach to risk management is not appropriate. Focusing on middle-of-the-range outcomes may result in unexpected catastrophic events that should have been foreseen. Existential risks are not amenable to the learn-from-failure approach of conventional risk management, nor can reliance be placed on the institutions, moral norms, or social attitudes developed from our experience with managing other sorts of risks.

The following guidelines are appropriate for assessing such climate risks:[71]

1. Use the best available information in an open, transparent and inclusive manner, drawing from diverse sources and methods of analysis, whether this is proven science, or expert judgment. A best estimate is usually better than no estimate at all.
2. Take a normative approach to managing risks, setting targets and developing strategy, assessing risks in relation to objectives, or interests. Start from an understanding of what it is that we wish to avoid; then assess its likelihood. Be explicit about value judgments, recognising that they are essentially subjective.
3. Recognise that the science of climate change is inherently complex because it describes the dynamics of a multi-dimensional, non-linear system, involving many subsystems and networks of adverse cascade effects; and recognise that climate-economy models are of limited use.
4. Identify the worst, as well as most likely, cases. Properly assess the full range of possibilities, recognising that a very low probability may correspond to a very high risk, if the impact is catastrophic.

5. Apply the precautionary principle when faced with uncertain threats that may cause systemic ruin, implementing measures to ensure those threats do not materialise, to the extent that is possible.
6. Take a holistic view and integrate responses — whether that be across government departments, or across national and regional boundaries — recognising that complexity cannot be treated in separate "silos".

A prudent, precautionary risk-management approach means a hard-nosed look at the real risks. The "fat-tail", high-end possibilities may be damaging beyond quantification and the potential consequences would be devastating for human society. It is important to understand the potential of, and plan for, the worst that can happen, and be pleasantly surprised if it doesn't.

Risk analysis must account for system complexity and radical uncertainty. The science of climate change is inherently complex because it describes the dynamics of a multi-dimensional, non-linear system, involving many subsystems and networks of adverse cascade effects.[72] Some responses to increasing levels of greenhouse gases are relatively linear and able to be projected well by climate models, such as near-term increases in temperature, increasing levels of atmospheric water vapour, more intense wind events, longer heat waves and so on. In this arena, climate models are very valuable.

But other responses are non-linear, characterised by sudden changes, rather than smooth progress, which take the system from one discrete state to another, possibly with system cascades. Factors contributing to this non-linearity include the existence of tipping points where a threshold exists beyond which large, system-level change will be initiated, and positive feedbacks or self-reinforcing loops driving further change. In a period of rapid warming, most major tipping points once crossed are irreversible on human time frames.

In complex systems, small changes can sometimes lead to large divergences in future state. The risks of climate change to human interests will depend not only on the direct impacts of changes in the physical climate, but also on the response of complex human systems such as the global economy, food markets, and the system of international security.[73]

Successful risk management requires thinking "outside the box", rather than in silos, to avoid a failure of imagination, but this is a skill rarely found at the senior levels of government and global corporations. A "failure of imagination" was, for example, identified as one of the reasons for the breakdown in US intelligence around the 9/11 attacks in 2001, and for banks and regulators not anticipating the 2008 GFC.

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."[74]

The report identified a deep reluctance, or what might be called "executive myopia" amongst top leaders in both the public and private sectors, to see and contemplate even the possibility that "unthinkables" might happen, let alone how to handle them. The rate and scale of change is much faster than most are even prepared to concede or respond to.

CASE STUDY

A billion people displaced by climate disruption?

By Admiral Chris Barrie AC (Retd) Former Chief of the Australian Defence Force

There is a pressing need to rethink global refugee governance to better support those displaced and fleeing from overwhelming climate-change impacts. Current governance structures are simply inadequate. Estimates of displacement numbers over coming decades illustrate the problem.

The Syrian war, in part driven by climate factors — an epochal drought and a climate-driven spike in wheat prices and the Arab Spring — led to the internal and external displacement of 13.5 million Syrians, more than half of the population. 6.8 million Syrians are refugees and asylum-seekers, and another 6.7 million people are displaced within Syria.[75]

A Rand report for the UK government concludes that "Rising sea levels in coastal regions and severe droughts in the Sub-Saharan region are likely to trigger population displacement. Other drivers of displacement could include natural resource shortages and competition as drinking water becomes scarcer and crop yields lower, or as crops are destroyed by extreme weather as in China where several studies indicate that crop yields for rice, wheat and maize will decrease."[76]

Could climate-security consequences include a billion displaced people?

- In 2007 senior US national security analysts concluded that: "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… poses an enormous challenge even if played out over the course of decades" (emphasis added).[77]
- A 2020 study on extreme heat found that "over the coming 50 years, one to three billion people are projected to be left outside the climate conditions that have served humanity well over the past 6000 years", and that at 3°C of warming "near unliveable" extremes are projected to "envelop 1.2 billion people in India, 485 million in Nigeria and more than 100 million in each of Pakistan, Indonesia and Sudan".[78] Another study from 2020 reached a similar conclusion: warming of 2°C could provide more than 500 million people with additional incentives to emigrate, whilst warming of 3°C could provide additional incentive-to-emigrate to well over a billion people.[79]
- In 2017, researchers wrote of "the likelihood of approximately half of the population exposed to deadly heat by 2050", which "could pose existential risks to humans and mammals alike unless adaptation measures are implemented, such as providing air conditioning to the entire population *or a massive relocation of most (sic!) of the population to safer climates*" (emphasis added).[80]
- The 2018 *Global Catastrophic Risks* report says that even for 2°C of warming more than a billion people may need to be relocated.[81]

Responding effectively to climate change will require greatly increased co-operation globally and regionally.

RESPONDING TO CLIMATE-SECURITY RISKS

AT A GLANCE

- Climate-security risk analysis should be based on a concept of human security which is people-centred and includes economic, health, environmental, community and political security.
- The path from physical climate impacts to security consequences is complex; the risks will increase and multiply and are likely being underestimated.
- Australia faces domestic risks that are both immediate — increasingly intense bushfires, cyclones, rain, drought and heatwaves — and cumulative risks such as rising sea levels, aridification, natural systems destruction and health impacts.
- Climate policymaking is affected by the "inertia paradox", where there is a delay between emissions and their physical effects, providing an illusory opportunity for political delay on the basis that events are not yet critical.
- Climate-proofing development for fragile or brittle states should be a priority for conflict prevention.

Photo: An Australian Army Chinook flight during the evacuation of local civilian residents on as bushfires burn Across East Gippsland (January 2, 2020).

The approach to climate-security risks must be a holistic one based on a concept of human security which is people-centred and includes economic, food, health, environmental, personal, community and political security, with instability and fragility understood as "the combination of exposure to risk and insufficient coping capacity of the state, system, and/or communities to manage, absorb, and mitigate those risks".[82]

Such risks for Australia are both domestic and global. Domestic risks are both immediate — such as the impacts of increasingly extreme bushfires, cyclones, extreme rain and inundation, and drought and extended and more intense heatwaves — and those that are cumulative such as rising sea levels, changing precipitation patterns, water availability and desertification, impacts on natural systems, health impacts of extreme heat and the geographical spread of diseases. Global risks include economic impacts overseas that directly affect Australia's exports and supply chains and imports; those that result in a humanitarian aid/disaster relief response from Australia; those that result in Australia committing military forces into an arena of conflict; and those that have geopolitical implications.

Climate disruption may start with growing food and water insecurity; however, social upheaval follows. But virtually no-one anticipated the crisis in Syria.

Or the Global Financial Crisis. 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 that "a psychology of denial" gripped the financial and corporate world, and that it was "the failure of the collective imagination of many bright people… to understand the risks to the system as a whole".[83]

This is the crunch point in climate and security analysis: how to understand the complex path from physical climate impacts to security consequences. It is particularly challenging to map first-order physical climate warming effects onto the second-order impacts in the social and security spheres because it depends on the responses of complex human systems which cannot be reduced to probabilistic terms. In a complex world, systemic risks can arise from interactions between changes in the physical climate and human systems, so that small changes can lead to large divergences in the future state.

Given the range of these issues and the complexities, how can climate-security risk be effectively analysed? In the first instance there is a need to understand:

— **Direct physical risks** from the climate's response to greenhouse gas emissions globally. This is no trivial task. In July 2021, the world witnessed a series of extreme climate events including unforeseen, record-destroying "dome" heatwaves and unprecedented flooding across the Northern Hemisphere, more intense than climate model projections. As were Australia's 2019-20 bushfires. Former UK Met Office chief scientist Prof Dame Julia Slingo told BBC News: "We should be alarmed because the IPCC models are just not good enough", and Oxford Professor Tim Palmer says: "It is impossible to say how much of an emergency we are in because we don't have the tools to answer the question."[84] So even with the more direct climate security risks from extreme events today, there is no straightforward answer to the question: "How bad could it be?"

— **Indirect risks** generated by the interaction of climate change and complex human systems, where a number of destabilising processes can interact, producing unexpected outcomes. There are many facets: increasing natural resource competition/conflict, livelihood insecurity, human mobility, food price spikes and food insecurity, extreme weather events challenging government responses, and international tensions.[85] The convergence of such climate and other risks results in compound security threats. Take one example: will the loss of the ice sheets (already well underway) in the Himalayan and Tien Shan ranges and Tibetan Plateau — where all the major rivers of Asia arise — exacerbate regional geopolitical tensions as water shortages in India, Pakistan and China become more critical and dam construction and control of rivers flowing from these ranges through several nations become flashpoints? China has 20% of the world's population but only 6% of potable water. There are long-standing border disputes between India, Pakistan and China, and all three are nuclear-armed. To the north-west, Central Asia, including Afghanistan, will suffer increasingly dire water insecurity, and internal displacement and regional conflict over water rights is possible in this strategic zone that stretches to Iran. In Bangladesh, relatively small increases in sea levels will displace tens of millions of people, and India has surrounded the country with a formidable climate-security fence guarded by tens of thousands of troops; India faces the twin perils of unliveable heat and chronic water shortages; there has been a shift westward of the Indian summer monsoon, and rainfall has become more variable; and Pakistan may become a failed state, plagued by internal and neighbouring conflicts, acute water deficits, new heat extremes and a history of civilian society–military tensions. South Asia has some of the world's largest cities and river deltas most vulnerable to inundation, as does China. These are complex issues to analyse.

— **Risks dependent on emissions path.** What are the risks if the world does manage to keep warming well below 2°C? And what are the risks if it does not, as the probability of a "Hothouse Earth" outcome increases with higher levels of warming? What are the geopolitical risks associated with a failure to decarbonise, and the consequences of unilateral actions to cool the planet, for example, by atmospheric sulfate injections, if there is a failure to form a global governance framework? If there is an unacceptable risk that the world is heading for widespread societal disruption and collapse, then assessments need to be made about actions necessary to prevent that outcome, even if those actions — such as a full-spectrum mobilisation of resources for the climate battle — are themselves disruptive of the status quo.

The understanding of climate-security risks and how to reduce those risks is improving. Key insights into climate impacts on security and peace (see box, page 33) summarises some important lessons: the fact that these risks will increase and multiply; the importance of governance capacity and flexibility (or the lack of it); the recognition that the risks are likely being underestimated; and acknowledgement that assessing and managing risks is challenging in a changing risk landscape.

INSIGHTS

Climate impacts on peace & security

- **The risks that climate change impacts pose to international peace and security are real and present.**[86] Climate change impacts inhibit peace by undermining human security, which increases the risk of violent conflict, as well as increasing the impact of other drivers of conflict and fragility.
- **Climate change impacts affect competition and conflict over natural resources such as land and water.** Climate change impacts can create new disputes over natural resources, especially in areas where conflict management mechanisms are weak. Infrastructure development (such as dams) and increasing water withdrawal can harm downstream countries and spur diplomatic tensions. Closer cooperation across transboundary river basins is required.
- **Climate change impacts undermine livelihoods, affect human mobility, and push people into illegal coping mechanisms**, including non-state armed groups. Partly in response to climate impacts, internal migration is likely to grow, which may create tensions with underserved host communities and stretch capacities in rapidly growing urban areas.
- **Climate change impacts contribute to extreme food price spikes and food insecurity**. This has already contributed to protests (e.g. the Arab Spring) and conflict, and risks to food production will increase.
- **Extreme weather events challenge government effectiveness and legitimacy**. Adequate relief responses can avoid grievances and large negative responses following disasters.
- **The unintended consequences of poorly designed climate and security policies carry their own risks**. Military responses to conflict can add further pressure on climate-sensitive livelihoods if planning disregards climate vulnerability.
- **Climate-related security risks are particularly significant where governance mechanisms are weak or failing**. Context and governance play a large role in determining how climate-related security risks manifest, and climate change impacts inhibit peace by adding to existing pressures.
- **We are very likely underestimating the scale and scope of climate-related security risks.** Many climate-related security risks remain under-researched because of the complexity of cascading risks, and the difficulty of clear attribution, as well as indirect effects through impacts on health and inequality, for example.
- **Climate-related security risks will increase and multiply in the future**. Impacts will intensify with further warming, and climatic tipping points are creating large uncertainties over future climatic changes and their effects on societies, and might be a source of sudden and large risks.
- **Our capacities to assess and manage climate-related security risks lag behind the changing risk landscape**. Assessment tools and early warning systems rarely address climate-related security risks. Conflict-affected countries are not sufficiently accounted for in funding and programming.

Military responses to challenges abroad will be affected by domestic capability that itself is suffering from climate impacts. We cannot think that our military can just be prepared for the next war, because the systems and environment in which the military operates are also changing.

The *World climate and security report 2021* (see box, page 35) identifies both the changing nature of climate-security risks, and some key responses. The impact of climate stressors or shocks is dependent on exposure and vulnerability, so "climate-proofing development for fragile or brittle states should be a priority for conflict prevention. Assistance should be aimed at climate resilience challenges such as water security, food security, and disaster preparedness".[87]

Perhaps the key question is the relationship between efforts to mitigate physical climate change — by reducing/eliminating its causes, and actions to reduce warming and drawdown the level of atmospheric greenhouse gases — and efforts to adapt by actions that moderate damages from actual or expected impacts. What effort should be put into each response?

A 2017 survey of global catastrophic risks by the Global Challenges Foundation (GCF) found that: "In high-end [climate] scenarios, the scale of destruction is beyond our capacity to model, with a high likelihood of human civilisation coming to an end."[88] The 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. It concludes that "the world is currently completely unprepared to envisage and, even less, deal with the consequences of catastrophic climate change".[89]

There is a truism that the world should adapt to those climate impacts that can't be mitigated, and mitigate those to which the world cannot adapt. Therefore, a key question is how much adaptation is possible. As previously discussed, 3–4°C is regarded as catastrophic to existential, but there is an unacceptable risk that 2°C of warming, and perhaps less, could trigger the "Hothouse Earth" scenario and drive warming towards the 3–4°C. Is it reasonable then to assume that the world can adapt to 3°C of warming? It appears not, and, even at 2°C there is an unacceptable risk that many of the most important climate systems will have passed tipping points by then. And the precautionary approach (see page 27) should be applied when faced with uncertain threats that may cause systemic ruin, implementing measures to ensure those threats do not materialise, to the extent that is possible.

This is the key understanding in analysing and responding to climate-security risks: if primary emphasis is not placed on mitigation mobilisation to address the causes and ensure that the higher-end threats do not materialise, the idea that the world can adapt to the consequences of higher levels of warming is an impractical one, poorly grounded in the evidence. This is the "adaptation trap" of one-sided emphasis on adaptation and "resilience" approaches at the expense of mitigation, which climate-security responses must seek to avoid. Adaptation is vital, but there is a point beyond which the frog cannot adapt to the water in the saucepan that is starting to boil around it.

Climate policymaking is affected by what may be called the "inertia paradox": inertia in the climate system (the delay between emissions and their physical effect) provides an illusory opportunity for political inertia or delay (on the basis that events are not yet critical), but unstoppable and catastrophic climate disruption may be in the pipeline for those emissions, even as political will and the time horizon are limited. This inertia is perhaps the greatest risk.

INSIGHTS

World climate & security report 2021

In June 2021, the International Military Council On Climate And Security released *The world climate and security report 2021*.[90] Key findings included:

- The convergence of climate change and other risks creates compound security threats for states and societies.
- Climate-security risks will continue to intensify across all regions, with new disasters hitting before societies can recover from or adapt to the impact of previous ones.
- Experts anticipate all climate-security phenomena presenting severe-to-catastrophic risks by as soon as 2031, with water, ecosystem, health, and national security climate threats posing the most consistent risk.
- Of particular concern in the short term will be direct environmental impacts, including precipitation changes, sea-level rise, and more severe natural disasters, as well as the subsequent effects that those impacts will pose to agricultural, economic, and healthcare systems worldwide.
- Over the next 30 years, "instability within nations" is likely to be more severe than "instability between nations".
- Climate-proofing development for fragile or brittle states should be a priority for conflict prevention. Assistance should be aimed at climate resilience challenges such as water security, food security, and disaster preparedness, as well as recovery mechanisms that encourage investments in renewable energy and adaptive capacities.
- Reducing climate-related security risks requires multiple different actors across many fields, to include peacebuilding, mediation, disaster preparedness, climate adaptation and climate mitigation.
- Militaries will be increasingly overstretched as climate change intensifies.
- While direct climate change effects regularly threaten military infrastructure and threaten to reduce readiness, the most pressing security threats will come from climate change-induced disruptions to social systems.
- Predictive modeling and climate risk assessment methodologies should be embraced to better prepare for and prevent climate security risks, and integrated into militaries' regional security plans and force readiness assessments.
- The global governance system is ill-equipped to deal with the security risks posed by climate change. In some cases international law is modeled on outdated understandings, while in other cases law or norms to manage certain climate security risks do not yet exist. States and international actors must take urgent action to update and develop international law and mechanisms to include environmental and climate security impacts.

CONCLUSION: AN UNPRECEDENTED PEACETIME MOBILISATION

TIME IS SHORT

Time to respond is short. Avoiding catastrophic outcomes requires a mobilisation of resources across the globe for rapid, large-scale mitigation, the building of capacity to drawdown atmospheric CO_2 to a safe level, and whatever efforts are efficacious to preserve threatened ecosystems, particularly in the Arctic.

CODE RED

The scientific evidence is that the world will reach 1.5°C in the next decade regardless of the short-term emissions trajectory, and 2°C by 2050, even if emissions are substantially reduced. Currently, global emission-reduction actions will lead to around 3°C of warming, and more once significant carbon-cycle feedback loops — which are now becoming active — are taken into account.

EXISTENTIAL THREAT

Impacts of 3–4°C of warming would be catastrophic to existential; even 2°C of warming would mean that many of the largest elements of the climate system — the cryosphere, carbon stores, circulatory systems — would have been irrevocably transformed.

RISK CONCLUSIONS >>>

BEYOND ADAPTATION

The human and political impacts at 3°C would be profound, and particularly in our region of the world, with state failure, military conflicts, and an epic and essentially unsolvable humanitarian crisis. The world cannot reasonably adapt to this level of warming.

INSECURITY & CRISIS

Even 2°C of warming would transform Australia: both for the changes within the country, and the external impacts. In Australia, and in the region, aridification of the dry subtropics will add to water insecurity at home and a water crisis in Asia's biggest and most populous states.

REGIONAL IMPACTS

Food insecurity will deepen across Asia; some low-lying Pacific Islands will be unfit for habitation; agriculturally productive river deltas and low-lying valleys from the Ganges to the Mekong will become inundated, and some of Asia's biggest cities will slowly succumb to rising seas, from Jakarta to Shanghai. Disasters caused by more extreme climate events will become more intense and frequent; states will become unstable and/or fail; and regional geopolitical tensions are likely to rise.

ILL-PREPARED

Our assessment is that Australia is ill-prepared to deal with the consequences of global warming, which requires decisive policy action, both in terms of mitigating the threat, and an understanding of, and preparedness to respond to, climate-security risks.

INTEGRATION

To be ready and able, Australia needs integration across all levels of government, and a whole-of-government approach at the national, state and local levels; one way or another almost every federal government department will need to be involved: defence and intelligence, emergency response and aid, foreign affairs and trade, health and social services, industry and transport, research and education, and so on.

RESPONSE CONCLUSIONS >>>

GET READY

A number of specific actions should be taken as a matter of urgency as a precursor to making the government fit-for-purpose on climate-security risks, including:

a. Appointment of an independent, expert panel to urgently conduct a comprehensive Climate and Security Risk Assessment, using the best available information;

b. The establishment of a specific Office of Climate Threat Intelligence that can provide an integrated flow of analysis to government and departments;

c. Establishment of a National Climate Risk Assessment, as occurs in the US, where a high-level experts group works with relevant agencies to provide a regular, publicly-available assessment of climate trends, risks and impacts; and

d. The preparation of a policy of Responsibility to Prepare and Prevent (R2P2), which systematically and holistically addresses climate-security risks.

FATEFUL CHOICE

We have a choice...

An unprecedented peacetime mobilisation to protect, prevent and prepare

or

Further procrastination and a descent into instability and social breakdown.

PREVENT. PREPARE. PROTECT.

A Climate-Security Risk Action Plan for Australia

Our action plan has four themes: Demonstrate leadership, Assess climate risks, Coordinate and cooperate, and Act and invest with urgency.

Demonstrate leadership

The first duty of a government is to "protect the people": their safety and wellbeing, their livelihoods and health. Despite some mistakes along the way, we have seen government at state and federal levels commiting to protect the Australian people from Covid-19 with a set of policies and actions that have required national, coordinated leadership for a "zero community transmissions" policy and action to prevent spread — from lockdowns to large government deficits — that were not politically easy.

Secondly, that leadership has been open about the risks and the solutions, the modelling and the choices, the costs and the benefits, and the long-term outcome. Money has not been spared in boosting research, getting the best expert advice, and communicating what needs to be done.

Thirdly, usual administrative arrangements have been put to one side, as necessary, to build integrated and whole-of-government responses, including the establishment of the national cabinet and new administrative arrangements in the states.

We urge that similar energy and application be applied to climate-security risks with demonstrable leadership to:

- **Show** the Australian people that our leaders care by committing to protecting the Australian people with imaginative and credible climate plans to safeguard our future.
- **Acknowledge** climate disruption as an existential risk to society and a threat to the stability of nations and the relationships between them if we act too late, or inadequately.
- **Seize** the initiative by conducting informed, national public conversations and working with all levels of government communities, business and academia in carrying out regular National Climate Risk Assessments.

Assess the risks

The risks have been elaborated at length in this report, including their existential character and the need for a precautionary approach to risk management. Once again, the Covid-19 response shines a light on managing the risks, at least in the outset. Governments were very frank about the risks, especially those at the high-end of the range of possibilities. In many cases, more ICU beds were prepared than it turned out were necessary, because the other possibility — not enough beds — was not to be countenanced. What would happen if a similar approach was taken to climate disruption, where policymakers erred on the side of being over-prepared, rather than under-prepared?

There is a need for an urgent, expert review of climate-security risk as a building block to a full policy. Ongoing analysis from an Office of Climate Threat Intelligence with new governance structures could break down bureaucratic silos, give longer-term perspectives and provide regular assessments by consistent monitoring and assessment of climate change risks.

Actions should include:

— **Appoint** an independent, expert panel to urgently conduct a comprehensive Climate and Security Risk Assessment, using the best available information.

— **Establish** an Office of Climate Threat Intelligence.

— **Assess** the threats and impacts of climate disruption with brutal honesty, identifying the worst, as well as most likely, cases and considering the full range of probabilities.

Coordinate and cooperate

Some of governments' most notable risk-management failures have been due to "thinking in silos" and not adopting a coordinated, whole-of-government or whole-of-system approach to understanding risks, of which the failures to foresee and be adequately prepared for the 2019-20 "black summer" bushfires and the Covid-19 pandemic are but two notable examples. The need to integrate risk analysis, policies and action across federal government departments, and between all levels of government, cannot be overemphasised.

Coordination is also important in Australia's response to a changing climate. We have witnessed the consequences of being ill-prepared for the impacts of some extreme climate events, such as bushfires, and the lack of readily-available equipment when Covid-19 affected Australia. Our oil energy supply lines are insecure, as is our national logistical capacity in the face of cyclones and floods. An Australian National Resilience Framework is required for these, and broader, issues.

On climate action, cooperation — not conflict — is key. Writing recently in the *Financial Times* on security and cooperation, Harvard professor and former US Treasury secretary Lawrence Summers argued that: "Coronavirus is helping to usher in a world where security depends more on exceeding a threshold of cooperation with allies and adversaries alike than on maintaining a balance of power."[91]

The world needs a robust climate pact for security, which involves all the major emitting countries, including China, which is today the world's biggest emitter. But the US is the greatest historical source of emissions, and together the US and China account for 40% of today's global emissions. Before the Paris climate talks in 2015, the US and China announced their own climate deal. And, in the lead-up to President Biden's 2021 Climate Summit, there was a joint China-US statement that climate change "must be addressed with the seriousness and urgency that it demands".[92] The US and China must work together for a climate and security pact, and Australia should be on board.

Actions should include:

— **Coordinate** a holistic, whole-of-government approach, building capacity across the public service and government agencies, and at all levels of government.

— **Cooperate** with big and small Asia-Pacific governments to build alliances for climate action, understanding that cooperation rather than conflict is key to responding to the climate crisis.

— **Build** an Australian National Prevention and Resilience Framework with coherent processes across areas including energy and water, logistics, health, industry and agriculture, research and nature.

Act and invest with urgency: Protect, prevent and prepare

Climate impacts disportionately fall on the most vulnerable and socio-economically disadvantaged communities. Building their capacity to withstand and respond to climate shocks is a key task in ameliorating climate-security risks, both in Australia and globally, and preventing social breakdown, conflict and forced displacement.

But, as discussed in this report, reducing the risks through adaptation strategies will not be effective at the higher levels of warming that are on the horizon. "Resilience and adaptation buys us time, but ultimately there is no way to insulate ourselves from the massive disruption that would be caused by unmitigated climate change," says Michael E. Mann.[93] Due to some inertia between emissions and impacts, hard and fast reductions right now in greenhouse gas emissions provide the best opportunity to manage climate-security risks.

Being prepared demands a focus on "inclusive and integrated responses that build resilience against both climate and conflict risks and include a special focus on 'no regret options' in the face of uncertainty and shifting probabilities of climate-related hazards and future socio-political developments".[94] The Australian Government should adopt a policy of responsibility to prepare and prevent, which systematically and holistically addresses climate security risks, with national, regional and international adaptability, to decrease the probability of instability and conflict, and promote adaptive pathways and sustainable development. The complex, transnational and cross-sectoral nature of climate risks demands such a comprehensive approach.

Actions should include:

— **Protect** the most vulnerable communities, nations and natural systems.

— **Prevent** devastating climate impacts by mobilising all the resources necessary to reach zero emissions as fast as possible. Develop the capacity to prevent irreversible tipping points and draw down greenhouse gases back to safer conditions in the long term.

— **Prepare** to manage the risks and respond to the challenges of living in a climate-change-disrupted world with a responsibility to prepare and prevent.

We have called Australia's response so far to climate-security risks "missing in action" because, right now, there is no greater duty for those who have served our nation than to speak out about the need to protect people and their safety. This is the crucial decade to shift Australia's focus to "leading in action" to address the great climate challenge we face.

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Photo: Aerial image from above with Syrian migrants/refugees as they arrive from Turkey on a boat near Molyvos, Greece.

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