



## **Climate Council of Australia**

**Submission to: Foreign Affairs, Defence and Trade References Committee.**

**Inquiry into the Implications of climate change for Australia's national security**

Addressed to:

[fadt.sen@aph.gov.au](mailto:fadt.sen@aph.gov.au)

Submission from:

Climate Council of Australia Pty Ltd  
PO Box 1267, Potts Point 2011

3 August 2017

## Contents

<b>The Climate Council and Climate Security.....</b>	<b>p. 3</b>
<b>Executive Summary.....</b>	<b>p.4</b>
<b>Section 1: challenges and responses to Australia’s climate security threat....</b>	<b>p.5</b>
The threats and long-term risks posed by climate change to Australia’s national and international security.....	p.5
The capacity and preparedness of the Australian Defence Force to respond to climate change risks in our region.....	p.6
The role of climate mitigation policies in reducing national security risks..	p.8
<b>Recommendations.....</b>	<b>p.10</b>
Military planning and operation recommendations.....	p.10
Military training and testing recommendations.....	p.10
Military and acquisition supply chain recommendations.....	p.13
<b>References.....</b>	<b>p.14</b>

## The Climate Council and Climate Security

The Climate Council is an independent non-profit organisation that provides authoritative, expert advice to the Australian public on climate change. The Climate Council has produced 83 reports and briefing papers to date and has reached over 350 million readers, viewers and listeners.

The Climate Council has worked on climate change and its implications for security over a number of years. In 2015 the Climate Council worked with former Chief of the Australian Defence Force Admiral Chris Barrie (Ret.), Climate Councillor Professor Will Steffen and Climate Security Specialist Major Michael Thomas (Ret.) to produce a landmark report titled *Be Prepared: Climate Change, Security and Australia's Defence Force* (The Climate Council 2015). Throughout 2015 Climate Council experts used this report to brief hundreds of domestic and international stakeholders on climate change and security and its implication for Australia's Defence Force.

In 2015 the Climate Council held Australia's first climate security summit bringing together world renowned defence leaders and scientific experts to discuss climate change and its security implications, including international experts UK Rear Admiral Neil Morisetti RN (Ret.), Rear Admiral Dave Titley USN (Ret.).

Throughout 2015 and 2016 the Climate Council generated hundreds of news items on climate change and security and continues to communicate on this significant threat to Australia's security.

In 2016 the Climate Council held an intergovernmental roundtable on climate change and security with representatives from a range of government departments.

In 2016 climate change was included throughout the Liberal Government's Defence White Paper.

To find out more about the Climate Council's work, visit [www.climatecouncil.org.au](http://www.climatecouncil.org.au)

## Executive Summary

The Climate Council thanks the Foreign Affairs, Defence and Trade References Committee for the invitation to make a submission to the inquiry on the implications of climate change for Australia's national security.

The science is in and defence forces are resolute. Climate change is a growing security threat. Climate change poses a significant and growing threat to human and societal well-being, threatening food, water health and national security. As a result, global military forces are labelling climate change a threat multiplier. Increasingly climate change is putting the Australian Defence Force under pressure, requiring urgent action from the Australian Department of Defence (AusDoD). The UK and US militaries are rapidly preparing for climate change and there are urgent steps that the AusDoD must take to follow their strategic allies and increase military preparedness and resilience in the face growing climate risks.

This submission addresses the following Terms of Reference:

- (a) The threats and long-term risks posed by climate change to national security and international security;
- (b) The capacity and preparedness of Australia's relevant national security agencies to respond to climate change risks in our region; and
- (c) The role of climate mitigation policies in reducing national security risks.

This submission makes a range of recommendations for the AusDoD that span military planning and operations, training and testing, estate and acquisition. All of these recommendations have been implemented by the United States Department of Defence (USDoD) and/or UK Ministry of Defence (UKMoD). Examples are provided to support each recommendation. It is worth noting that many of the USDoD examples were implemented under the Obama administration and whilst the USDoD continues to identify climate change as a significant security threat, future progression of some programs and case studies are uncertain under the Trump administration.

## Section 1: Challenges and responses to Australia's climate security threat

### 1. The threats and long-term risks posed by climate change to Australia's national security and international security

**The Earth has been experiencing a pronounced warming trend since the mid-20<sup>th</sup> century.** 2016 was the hottest year on record globally, surpassing previous records set in 2015 and 2014. Global average temperature has risen by about 1.1°C above the preindustrial baseline, with most of the warming occurring over the past 50 years (NOAA 2017). The rate of increase in global average temperature since 1970 is approximately 170 times the baseline rate over the past 7,000 years (Marcott et al. 2013; Steffen et al. 2016; NOAA 2017). This extremely rapid, long-term rate of temperature increase is being driven by the additional greenhouse gases in the atmosphere that have accumulated primarily from the burning of coal, oil and gas.

**Climate change is a security threat.** Climate change poses a significant and growing threat to human and societal wellbeing, threatening food, water, health and national security.

- **Food security.** The 2008 food crisis increased the number of undernourished people worldwide by 75 million. The cost of wheat increased by 127%, rice by 170% and maize by 300%. By increasing the frequency and severity of droughts in important food producing regions, climate change was a key factor in the crisis (Mittal 2009; McMichael 2009)
- **Water security.** Climate change will significantly affect the accessibility and availability of freshwater resources. Rising sea-levels can result in saltwater intrusion of coastal aquifers, while rainfall patterns are changing worldwide (IPCC 2012; Hijikata et al 2014).
- **Extreme weather.** All extreme weather events are being influenced by climate change as they are now occurring in a more energetic climate system (Trenberth 2012). Extreme weather events affect individuals and societies through the displacement of people, damage to critical infrastructure, and damage to health and livelihoods (Yonetani 2014)

#### **Global military forces are labelling climate change a “threat multiplier”.**

The impacts of climate change can exacerbate other stresses, like poverty, economic shocks and unstable institutions, to make crises worse. For instance, increasing extreme weather events can reduce the availability of food. Extreme weather and water scarcity contributed to soaring food prices, which saw food riots erupt across Africa and the Middle East in 2008 (von Braun 2008). Rising food prices in 2011 have also been identified as one of the factors that destabilised the Middle East, leading, for example, to the “Arab Spring” (Slaughter et al 2013).

Climate change can worsen tensions and increase the risk of conflict between states as sea-level rises, coastlines retreat and the eventual submergence of small low-lying

islands affect maritime boundaries and exclusive economic zones where natural resources are located (Houghton et al 2010; Warner and Schofield 2012).

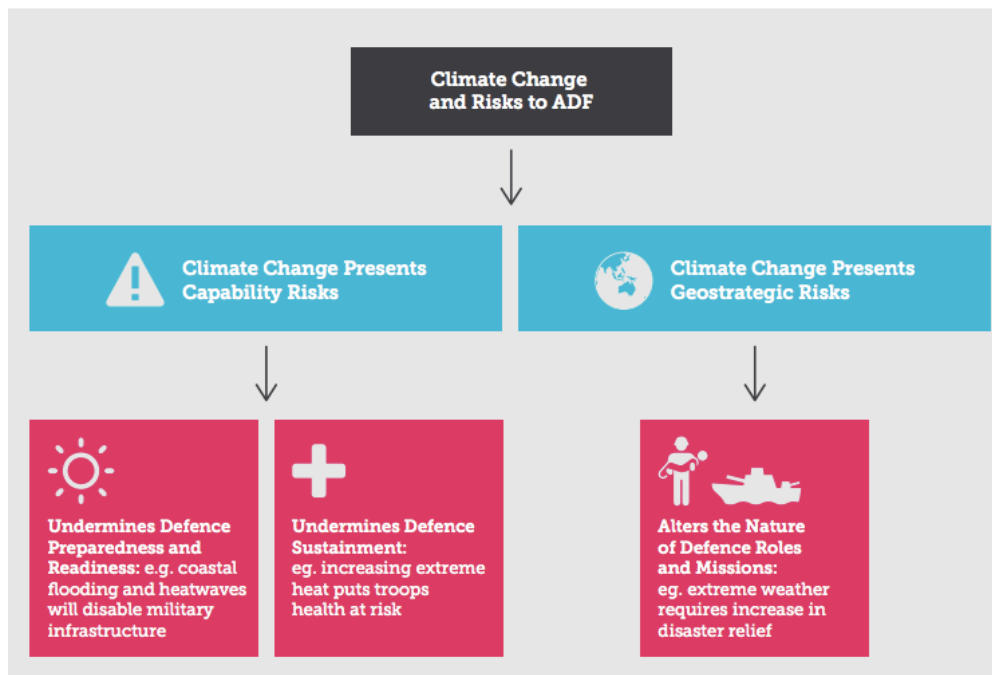
Leading international organisations and defence forces around the world, from the Pentagon to the North Atlantic Treaty Organisation (NATO) member states and the Group of 7 (G7), have all identified climate change as a significant threat to national security (The Climate Council 2015).

**Climate change puts the Australian Defence Force under pressure.**

Australia and the Asia-Pacific region are vulnerable to climate change with over half of the world's natural disasters occurring in the Asia-Pacific region in 2014 (UN 2014). The ADF will increasingly be called upon to deliver humanitarian assistance in response to extreme weather and its impacts both at home and overseas. In serious cases the ADF may need to coordinate with other countries to provide assistance (ANAO 2014; The Climate Council 2015). Extreme weather could also affect the ADF's readiness and capability by disabling critical military and civilian infrastructure at times when rapid mobilisation is needed. Defence property (military bases) are also at risk from sea-level rise and extreme weather. Rising temperatures and more frequent and intense heatwaves will have implications for the health of Australia's military personnel when undertaking training and conducting military exercises (Barrie and Steffen et al. 2015).

**2. The capacity and preparedness of the Australian Defence Force to respond to climate change risks in our region**

Climate change presents two types of risk to the ADF. The first are capability risks that undermine the ability of the ADF to be prepared and limit military readiness and sustainment. The US military calls these types of risks 'burden-multipliers' since they burden the military before it can even move into action and drain its effectiveness when operating in the field. The second type are geostrategic risks that may alter the types of roles and missions the ADF will need to undertake. Ultimately, these latter risks may affect the very structure and composition of the ADF. US strategists commonly refer to these types of climate risks as 'threat multipliers'



**Climate change could reduce military readiness and sustainment in a number of ways.** For example, rising temperatures will likely make it more difficult for military forces to train. Extreme and prolonged heat can directly affect human health by causing heat stress and even death; heatwaves kill more Australians than any other natural disaster (PwC 2011; Climate Council 2014).

**Extreme weather could also impact on ADF capability by disabling critical military and civilian infrastructure.** Especially at the crucial moments necessary for rapid ADF mobilisation. While military equipment is generally built to withstand extreme environmental conditions, civilian infrastructure, like roads and rail, are less prepared. Military bases rely on civilian infrastructure, such as water, power and transportation networks and they also rely on the civilian workforce for tasks like base security and estate management. Without the availability of the civilian road network, such as airstrips, trains, energy grids and communication networks, ADF military personnel would find it increasingly difficult to even gain access to ADF bases that are essential for mobilisation (Barrie and Steffen et al. 2015).

If suitable measures are not put in place, ADF readiness may be eroded through climate impacts on defence infrastructure, as well as national infrastructure more broadly. Primarily, this will occur through sea-level rise, storm surge, drought and other long-term changes to regional climatic conditions

**ADF energy security may also be affected by climate change, as the transition away from fossil fuels drives innovation in the renewable sector.** The US Navy serves as a clear example, by 2020 50 percent of all US Navy energy consumption will come from alternative sources and 50 percent of its shore installations will be carbon neutral (US Department of Navy 2015).

**Climate change and its impacts are altering the types of roles and missions the ADF will need to undertake now and into the future.** Increases in the frequency and intensity of extreme weather events place more pressure on the ADF to provide disaster relief and humanitarian assistance both within Australia, and in the Asia-Pacific region. Extreme weather has resulted in more than 275 domestic emergency assistance deployments for the ADF since 2005 (ANAO 2014).

Australia's proximity and relative prosperity in the Asia-Pacific region leave it well placed to assist with disaster response. The ADF already provides regional partners with humanitarian assistance and disaster relief. As the impact of extreme weather intensifies in the region there will be growing pressure on the ADF to increasingly coordinate with domestic emergency services and provide more humanitarian assistance at home and in Australia's neighbourhood (Dupont and Pearman 2006). Extreme weather events can occur concurrently; for example, there could be multiple bushfires in different Australian states as well as a coastal flooding event and a cyclone in the Asia-Pacific. The ADF will increasingly need to be prepared to assist in responding to multiple extreme weather events both in Australia and in the Asia-Pacific region simultaneously (Press et al 2013).

Climate change could also contribute to the forced movement of people and will serve to exacerbate conflict which could increase ADF participation in regional stabilisation operations including humanitarian disaster response as well as Defence cooperation measures (Barrie and Steffen et al. 2015).

### **3. The role of climate mitigation policies in reducing national security risks**

**Strong action to reduce greenhouse gas emissions is critical for limiting the security implications of a changing climate.**

Analysis shows that climate change and its impacts are already contributing to increases in the forced migration of people within and between nations, as well as playing a role in heightening social and political tensions, flowing onto conflict and violence. Analyses of recent global crises, such as the 2008 food crises demonstrate how climate change interacts with other, multiple stresses to make crises worse - climate change is a threat multiplier, exacerbating threats from other causes (Mittal 2009; McMichael 2009).

Leading security institutions and defence forces around the world, from the Pentagon to the UK military, have identified climate change as a significant threat to national security that requires immediate action by governments and military institutions alike. Former US President Obama stated in a 2015 address to the US coastguard, 'climate change constitutes a serious threat to global security, an immediate risk to our national security... and make no mistake, it will impact how our military defends our country'.

The security implications of climate change have been considered by the United Nations Security Council (UNSC) and General Assembly, assessed by the Intergovernmental Panel on Climate Change (IPCC), and identified as a security



concern by NATO and G7 member nations. Security sector experts identify climate change as a significant risk in three ways.

Firstly, climate change can influence a country's security environment by exacerbating economic and political problems within and between countries. Secondly, it can alter the types of roles and missions militaries need to undertake. For example, increases in the frequency and intensity of extreme weather events and the resulting destruction will place more pressure on militaries to provide disaster relief and humanitarian assistance. Finally, climate change can limit military readiness and burden the military before it moves into action. Military preparedness may be eroded through the impact that climate change is likely to have on Defence infrastructure through sea-level rise, extreme heat, storm surges and drought.

Global emissions must start tracking downward this decade if there is to be a chance of keeping the warming of the planet to below 2°C, and limiting the severity of climate change and its implications for security. Whilst defence forces can prepare for the potentially catastrophic risks posed by climate change, they cannot solve the problem alone. Australia must join the global effort to substantially reduce carbon emissions by rapidly replacing fossil fuels with renewable energy, battery storage technologies, improvements in energy efficiency and eliminating emissions elsewhere in the economy. If we are to reduce risks to our security, we must limit the impacts of climate change.

## Section Two: Recommendations

Based on the clear threat climate change presents to the Australian Defence Force and Australia's national security, the Climate Council proposes the following recommendations for military planning and operations, training and testing, estate and acquisition. All of the below recommendations have already been implemented by either the United States Department of Defense (USDoD) or UK Ministry of Defence (UKMoD) or both. Examples of how Australia's strategic military allies in the UK and US have implemented these recommendations in their respective countries has been provided in the footnotes that accompany each recommendation. It is worth noting that many of the USDoD examples were implemented under the Obama administration and whilst the USDoD continues to identify climate change as a significant security threat, future progression of some programs and case studies are uncertain under the Trump administration.

### 1. Military Planning and Operation Recommendations

#### **Recommendation 1.1: Mainstream climate change into military planning.**

Following in the footsteps of Australia's key strategic military allies, the USDoD and the Defence UKMoD it is essential that the Australian Department of Defence mainstreams climate change into all key national strategic (military) planning. This includes mainstreaming climate change into *public* national strategic documents such as the Defence White Paper as well as in key *internal* national strategic documents used by Defence.<sup>1</sup>

**Recommendation 1.2: AusDoD Climate Adaptation Strategy.** In addition to mainstreaming climate change into forthcoming military planning documents the AusDoD should strategically align with the USDoD by publishing a regular climate change adaptation strategy.<sup>2</sup>

**Recommendation 1.3: Australian Military Climate Change Envoy.** The AusDoD should show leadership by appointing a Senior Military authority as an Australian climate change planning officer/envoy.<sup>3</sup>

---

<sup>1</sup> **For US examples see:** Climate change was factored into the 2006 US National Intelligence Priorities Framework, 2008 US National Intelligence Assessment, 2008 US National Defense Authorization Act, 2010 and 2015 US National Security Strategy, 2010 and 2014 Quadrennial Defense Review; Executive Order 13653 – Preparing the United States for the Impacts of Climate Change (2013).

**For UK examples see:** 2008 and 2010 National Security Strategy; MoD Strategic Trends Programme: Global Strategic Trends out to 2014 (2010).

<sup>2</sup> **For US examples see:** US Climate Change Adaptation Roadmap within US DoD Strategic Sustainability Performance Plan; US Navy Climate Change Roadmap; US Army Corps of Engineers Climate Adaptation Statement (2011) and Climate Preparedness and Resilience Policy Statement (2014).

**For UK examples see:** (Defence in a Changing Climate); 2010 MoD Climate Change Delivery Plan; 2011 MoD Sustainable Development Strategy.

<sup>3</sup> **For US example see:** Admiral David W. Titley served as US Chief Oceanographer and initiated US Navy Task Force Climate Change.

**For UK example see:** Rear Admiral Morisetti (2009) – UK Climate Envoy.

**Recommendation 1.4: Interdepartmental working group.** AusDoD should actively and regularly engage in an interdepartmental/interagency climate change working group.<sup>4</sup>

**Recommendation 1.5: Ongoing analysis of climate change impacts on military bases.**

AusDoD should engage in ongoing and regular analysis of the impacts of climate change on Australian military base locations and base capacity (force posture).<sup>5</sup>

**Recommendation 1.6: Analysis of climate change impacts on force structure.** The AusDoD should conduct analysis of the climate change impacts on how the military is organised for combat missions, stabilisation operations and disaster relief (force structure).<sup>6</sup>

**Recommendation 1.7: The Department of Prime Minister and Cabinet & Australian Department of Defence should release an interagency White Paper on the National Security Implications of Climate Change.** A White Paper focused specifically on the security implications of climate change will build on the findings and analysis of the 2016 Defence White Paper.

---

<sup>4</sup> **For US example see:** the USDoD participated in Interagency Climate Change Adaptation Task Force (2009); Member of Council on Climate Preparedness and Resilience (2013); Executive Order 13514 – Federal Leadership in Environmental, Energy and Economic Performance (2009); Executive Order 13653 – Preparing the United States for the Impacts of Climate Change (2013).

**For UK example see :** The appointment in 2009 by Foreign and Commonwealth Office of military climate envoy to integrate climate change across government departments; UK Climate Impacts Programme (UKCIP).

<sup>5</sup> **For US example see:** 2008 National Defense Authorization Act; The Presidents Climate Action Plan (2013); Executive Order 13514 – Federal Leadership in Environmental, Energy and Economic Performance (2009); 2010/2015 QDR and NSS; US Climate Change Adaptation Roadmap within US DoD Strategic Sustainability Performance Plan; Executive Order 13653 – Preparing the United States for the Impacts of Climate Change (2013).

**For UK example see:** 2010 Climate Strategy (Defence in a Changing Climate); 2010 MoD Climate Change Delivery Plan; MoD Climate Impact Risk Assessment (2012); MoD Climate Impacts Risk Assessment Methodology (2012).

<sup>6</sup> **For US example:** 2008 National Defense Authorization Act; Executive Order 13514 – Federal Leadership in Environmental, Energy and Economic Performance (2009); US Climate Change Adaptation Roadmap within US Strategic DoD Sustainability Performance Plan; Executive Order 13653 – Preparing the United States for the Impacts of Climate Change (2013).

**For UK example see:** 2010 Climate Strategy (Defence in a Changing Climate); 2010 MoD Climate Change Delivery Plan; MoD Climate Impact Risk Assessment (2012); MoD Climate Impacts Risk Assessment Methodology (2012).

## 2. Military Training and Testing Recommendations

**Recommendation 2.1: Analysis of climate change risks to military training.** As outlined in Section 1, climate changes poses a range of risks to the training of Australian military personnel. A detailed analysis of these risks is vital to help the AusDoD fully understand these risks and how they will worsen over time.<sup>7</sup>

**Recommendation 2.2: Analysis of climate change impacts on the preparedness of the military to respond to operations and emergencies.**

As outlined in Section 1, worsening climate impacts will limit the ability of Australian military personnel to be prepared and respond rapidly to operations and emergencies on multiple fronts. A detailed analysis of exactly how preparedness will be effected is vital to assist forward planning by AusDoD.<sup>8</sup>

## 3. Military Estate (Built and Natural Infrastructure) Recommendations

**Recommendation 3.1: Mandate renewable energy targets for military bases.** Increasing renewable energy on military bases not only increases energy security and the resilience of bases it also contributes to mitigating the threat of climate change in the long-term.<sup>9</sup>

**Recommendation 3.2: Continue to conduct updated risk assessments of climate affected extreme weather events on military bases & share with affected local stakeholders.** It is not only coastal flooding, but also extreme heat, super charged storms and more severe bushfires are all worsening climate impacts that have implications for the security of military bases in Australia. An ongoing detailed assessment of this risk needs to be conducted.<sup>10</sup> In addition to conducting these risk

---

<sup>7</sup> **For US example:** This kind of analysis has been conducted by USDoD, see US Climate Change Adaptation Roadmap within US DoD Strategic Sustainability Performance Plan; US DoD Response to Congress on National Security Implications of Climate Change (23 July 2015 in response to Senate Report 113-211, H.R. 4870).

**For UK example:** 2010 Climate Strategy (Defence in a Changing Climate); 2010 MoD Climate Change Delivery Plan; MoD Climate Impact Risk Assessment (2012); MoD Climate Impacts Risk Assessment Methodology (2012).

<sup>8</sup> **For US example see:** 2008 National Defense Authorization Act; 2010 QDR; 2010 NSS; US DoD Response to Congress on National Security Implications of Climate Change (23 July 2015 in response to Senate Report 113-211, H.R. 4870); US Climate Change Adaptation Roadmap within US DoD Strategic Sustainability Performance Plan.

<sup>9</sup> **For US example see:** The Presidents Climate Action Plan (2013); US DoD Strategic Sustainability Performance Plan; Executive Order 13653 – Planning for Federal Sustainability in the Next Decade (2015); US DoD Instruction 4170.11, ‘Installation Energy Management’ (Dec 2009).

**For UK example see:** UK MoD Sustainability Strategy (2011); UK Greening Government Commitment Targets (2014).

<sup>10</sup> **For US example:** 2008 National Defense Authorization Act; US DoD Response to Congress on National Security Implications of Climate Change (23 July 2015 in response to Senate Report 113-211, H.R. 4870).

**For UK example see:** MoD Climate Impact Risk Assessment (2012); MoD Climate Impacts Risk Assessment Methodology (2012); 2010 MoD Strategic Trends Programme: Global Strategic Trends out to 2040.

assessments these findings need to be shared with affected local stakeholders to assist mitigation and adaptation planning across all levels of government.

**Recommendation 3.3: Continue to implement ‘Green’ building codes and energy programs across military bases.** Continuing to increase the energy efficiency of military bases helps to reduce costs as well as contributing to mitigating the threat of climate change in the long term.<sup>11</sup>

#### 4. Military Acquisition and Supply Chain Recommendations

**Recommendation 4.1: Continue to promote the uptake of energy efficient military hardware and implement sustainable procurement practises.** Promoting the uptake of energy efficient major military hardware platforms (e.g the use of bio-fuels and hybrids) will play a role in helping to mitigate the climate change threat. Sustainable procurement practises such as energy efficient civilian fleets, energy efficient lighting, heating and waste reduction strategies will also be key.<sup>12</sup>

---

<sup>11</sup> **For US example see:** Evidence/Reference: US Army Net Zero Program; US Navy Energy Program (2010); US Strategic Sustainability Performance Plan; Executive Order 13693 – Planning for Federal Sustainability in the Next Decade (2015); US DoD Instruction 4170.11, ‘Installation Energy Management’ (Dec 2009); US Green Building Council Leadership in Energy and Environmental Design (LEED; Department of Defense Sustainable buildings Policy (10 Nov 2013); Unified Facilities Criteria 1-200-02, ‘High Performance and Sustainable Building Requirements’ (1 Mar 2013); NAVFAC Sustainability and Energy Requirements 2014-02 (2014).

**For UK example see:** UK MoD Sustainability Strategy (2011).

<sup>12</sup> **For US examples see:** Energy for the Warfighter: Operational Energy Strategy (2011); Operational Energy Strategy Implementation Plan (March 2012); US DoD Strategic Sustainability Performance Plan; US Navy Energy Program (2010); Executive Order 13693 – Planning for Federal Sustainability in the Next Decade (2015). : Executive Order 13514 – Federal Leadership in Environmental, Energy and Economic Performance (2009); Executive Order 13653 – Preparing the United States for the Impacts of Climate Change (2013); US DoD Strategic Sustainability Performance Plan; Executive Order 13693 – Planning for Federal Sustainability in the Next Decade (2015).

**For UK examples see:** 2010 Climate Strategy (Defence in a Changing Climate); 2010 MoD Climate Change Delivery Plan; Evidence/Reference: UK MoD Sustainability Strategy (2011); UK Greening Government Commitment Targets (2014).

## References

ANAO (Australian National Audit Office) (2014) The Auditor-General, Audit Report No. 24 2013-14 Performance Audit: Emergency Defence Assistance to the Civil Community, ed. Department of Defence. Canberra: Commonwealth of Australia.

The Climate Council (2015) Be Prepared: climate change, security and Australia's Defence Force. Barrie, Steffen, Pearce and Thomas. The Climate Council. Accessed at <https://www.climatecouncil.org.au/uploads/fa8b3c7d4c6477720434d6d10897af18.pdf>

Climate Council (2014) Heatwaves: Hotter, Longer and More Often. Hughes L and Steffen W. Accessed at <http://www.climatecouncil.org.au/uploads/9901f6614a2cac7b2b888f55b4dff9cc.pdf>.

Department of Defence (2016a) Defence White Paper 2016, ed. Department of Defence. Canberra: Commonwealth of Australia. Accessed at <http://www.defence.gov.au/WhitePaper/Docs/2016-Defence-White-Paper.pdf>

Dupont A and Pearman G (2006). Heating up the Planet: Climate Change and Security. Accessed at [http://lowyinstitute.richmediaserver.com/docs/AD\\_GP\\_ClimateChange.pdf](http://lowyinstitute.richmediaserver.com/docs/AD_GP_ClimateChange.pdf).

Hijioka Y, Lin E, Pereira JJ, Corlett RT, Cui X, Insarov GE, Lasco RD, Lindgren E and Surjan A (2014) Asia. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1327-1370.

Houghton KJ, Vafeidis AT, Neumann B and Proelss A (2010) Maritime boundaries in a rising sea. *Nature Geoscience*, 3(12), 813-816.

IPCC (2014) Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1132.

Marcott SA, Shakun JD, Clark PU, Mix A (2013) A reconstruction of regional and global temperature for the past 11,300 years. *Science*, 339: 1198–1201.

McMichael P (2009) A food regime analysis of the 'world food crisis'. *Agriculture and Human Values* 26(4): 281-295.

Mittal A (2009) The 2008 Food Price Crisis: rethinking food security policies. G-24 discussion paper series: United Nations.

NOAA (National Oceanic and Atmospheric Administration) (2017) Global Analysis–Annual 2016. Accessed at: [https:// www.ncdc.noaa.gov/sotc/global/201613](https://www.ncdc.noaa.gov/sotc/global/201613).

Press A, Bergin A and Garnsey E (2013) Heavy Weather: Climate and the Australian Defence Force. Canberra: Australian Strategic Policy Institute.

PwC (PricewaterhouseCoopers) (2011) Protecting human health and safety during severe and extreme heat events: A national framework. Report by PriceWaterhouseCoopers Australia for the Commonwealth Government, November 2011. Accessed at <http://www.pwc.com.au/industry/government/assets/extreme-heat-events-nov11.pdf>.

Slaughter AM, Sternberg T, Johnstone S, Mazo J, Femia F, Werrell C, Werz M, Hoffman M, Michel D, and Yacoubian M (2013) The Arab Spring and Climate Change. In A Climate and Security Correlations Series, eds. Caitlin E. Werrell, and Francesco Femia. Washington DC: The Center for American Progress.

Steffen W, Leinfelder R, Zalasiewicz J, Waters CN, Williams M, Summerhayes C, Barnosky AD, Cearreta A, Crutzen P, Edgeworth M, Ellis EC, Fairchild IJ, Gajuszka A, Grinevald J, Haywood A, Ivar do Sul J, Jeandel C, McNeill JR, Odada E, Oreskes N, Revkin A, Richter D deB, Syvitski J, Vidas D, Wagreich M, Wing SL, Wolfe AP and Schellnhuber HJ (2016) Stratigraphic and Earth System approaches to defining the Anthropocene. *Earth's Future*, 4 (8): 324-345.

Trenberth KE (2012) Framing the way to relate climate extremes to climate change. *Climatic Change*, 115: 283–290.

US Department of Navy (2015) Secnavy energy goals. Department of Defence. Accessed at [http://greenfleet.dodlive.mil/files/2012/06/20120620\\_SECNAVEnergyGoals.pdf](http://greenfleet.dodlive.mil/files/2012/06/20120620_SECNAVEnergyGoals.pdf).

UN (2014) Disasters in Asia and the Pacific: 2014. Economic and Social Commission for Asia and the Pacific.

von Braun J (2008) The food crisis isn't over. *Nature*, 456(7223): 701-701.

Warner R and Schofield CH (Eds.). (2012). Climate change and the oceans: Gauging the legal and policy currents in the Asia Pacific and beyond. Edward Elgar Publishing.

Yonetani M, Lavell C, Meneghetti L, Richter S, Holladay S (2014) Global Estimates People displaced by disasters. Geneva: Internal Displacement Monitoring Centre, Norwegian Refugee Council; 2014. Available from: [http://www.nrc.no/arch/\\_img/9184209.pdf](http://www.nrc.no/arch/_img/9184209.pdf). Accessed: 6th June 2015.