Submission to the Inquiry into the Abbott Government's Direct Action Plan

Environment and Communications References Committee

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1. Executive summary

The key points made in this submission are:

- Psychosocial impacts of the Direct Action Plan
- Current climate threats to health and wellbeing
- Necessary action to mitigate the threat of climate change
- Impact and effectiveness of a Direct Action Plan

Recommendations:

- Climate policies must acknowledge and address the negative health and psychosocial impacts of climate change on individuals and communities.
- Projections of the economic viability of climate policies must factor in the huge societal and health costs of climate change.
- Climate policies should take into account established social science research addressing public engagement in the context of climate change and the fostering of pro-environmental change at behavioural and structural levels.
- Climate policies should motivate individuals, businesses and corporations to engage in long-term pro-environmental behaviours, and remove barriers to action.
- Climate policies should take account of evidence that the majority of Australians are concerned about climate change and support increased action.

2. The Australian Psychological Society

The Australian Psychological Society (APS) is the premier professional association for psychologists in Australia, representing more than 21,000 members. Psychology is a discipline that systematically addresses the many facets of human experience and functioning at individual, family and societal levels.

A number of convergent areas of psychological work and practice have focused on the challenges of global environmental change and global climate change for the past few decades. Environmental psychology, social psychology, health psychology, clinical psychology, disaster psychology, community psychology, and organisational psychology have made key contributions in addressing the human dimensions of climate change (e.g., Swim et al., 2009).

The APS has a Climate Change and Environmental Threats Reference Group comprised of psychological experts in environmental and social psychology. In

addition to a thorough understanding of human behaviour, our members have expertise in adaptation, disaster preparedness, barriers to behaviour change, resilience, the built environment, conservation of wilderness heritage areas, waste and recycling, media representations of environmental threats, risk perception and communication, stress and coping, and ongoing environmental stress, amongst other interests.

The APS welcomes the opportunity to provide input to the Environment and Communications References Committee Inquiry into the Abbott Government's Direct Action Plan on climate change. Australian psychologists, along with other members of the scientific and professional community, are increasingly concerned about the impact of environmental threats and climate change. Climate change is in a large part caused by human behaviours and directly affects human health and wellbeing. Psychologists thus have an integral role to play in addressing linkages between people and environmental problems and finding achievable and effective solutions.

3. Responding to the terms of the Inquiry

It is beyond the scope of the Australian Psychological Society to address all of the terms of reference in this Inquiry. We limit our response to some general comments based on the scientific literature about the threat to Australians' health and wellbeing posed by climate change, and evidence-based best practice with respect to effective public engagement and behavioural change interventions and policies in the context of environmental threats and problems.

We will also address critical omissions in this Inquiry, namely the neglect of psychosocial impacts of the proposed Direct Action Plan. Psychosocial impacts include the psychological and social impacts of government policies on individuals and communities, as well as the ongoing environmental threat and unfolding biophysical environmental impacts of climate change. How people perceive and understand government policies in turn influences how they think about and respond to climate change, how they think about their government, as well as their behavioural engagement and lifestyle changes that are necessary for climate change mitigation and adaptation. Understanding the current and projected psychosocial impacts of climate policies is therefore crucial to any inquiry into the impacts and effectiveness of the Direct Action Plan.

We draw the Committee's attention to the APS *Position Statement on Psychology and the Natural Environment*, based on a comprehensive Literature Review, the APS *Position Statement on Climate Change*, and a number of related submissions made to government inquiries in recent years. These resources can be accessed at: http://www.psychology.org.au/community/public-interest/environment/.

4. Current climate threats to health and wellbeing

The projected health and mental health effects of global climate change are profound (Climate Commission, 2011; Costello et al., 2009; DARA, 2012) (Refer to Appendix for a summary of health effects).

Psychological health professionals point to the accumulating evidence of the serious psychological impacts of the threat and implications of climate change (e.g., Doherty & Clayton, 2011; Swim et al., 2011). Psychological impacts range from mild stress responses to chronic stress or mental health disorders. Extreme weather events can lead to mental health disorders like depression and anxiety associated with grief and loss, social disruption, and displacement, as well as cumulative effects from repeated exposure to natural disasters.

The effects of climate change also impact upon the social, economic, and environmental determinants of mental health. Some communities are more likely to be exposed to climate change impacts due to their location (for example, coastal areas). Others have limited adaptive capacity due to poverty, poor physical and service infrastructure and economic reliance on climate vulnerable ecosystems. Some communities are vulnerable on both counts, and it is in these communities that the social and economic impacts of climate change are likely to be most severe (Fritze et al., 2008). The social impacts of reduced economic security caused by climate change can include stress, insecurity, social isolation, and strain on relationships.

Psychological impacts also include the stress and frustration accompanying the politicising of an impending human and biospheric disaster, along with public perceptions that their governments and authorities are not taking the actions necessary. Media coverage also strongly contributes to the ongoing environmental stressor status of climate change (Doherty & Layton, 2011; Reser & Swim, 2011).

The risk of a 2 degree temperature rise clearly threatens the stable and safe climate that the current and earlier generations have experienced, and takes future generations into the realm of a climate unknown in human civilisation (Hansen & Sato, 2011). There will be manifestly greater impacts and consequences over time. The world's poorest communities are and will continue to be the hardest hit, so climate change is a social justice issue as well.

5. Impact and effectiveness of a Direct Action Plan

Many submissions to this inquiry have already provided evidence indicating that the Government's proposed Direct Action Plan is inadequate to meet Australia's fair share of greenhouse gas emission reductions in order to keep global temperature rise to below 2 degrees (e.g., TCI Submission 2; EV Submission 25). However, we restrict our comments to the health and psychosocial consequences of the Direct Action Plan.

The health, mental health and psychosocial implications of climate policies that do not adequately reduce emissions are profound. The health costs alone of climate change impacts are enormous, from air pollution (coal mining and combustion – see Burt et al., 2013) to building a health system that can properly respond to increased demand from natural and humanitarian disasters. Serious health and social problems resulting from climate change impacts will require a major and costly increase in services which must be considered in evaluating the economics of the Direct Action Plan.

Of further concern, the Direct Action Plan also founders on the notion of paying individuals and corporations to cut their emissions. There is a compelling body of motivation research emanating over the past several decades documenting how such payments directly erode other motivations, and especially intrinsic motivation (Bandura, 1997, 2006; Carver & Scheier, 1998; Deci and Ryan, 2002; Deci et al., 1999; Gardner & Stern, 2002, 2008). The use of the extrinsic rewards of money to individuals/corporations who cut emissions is likely to erode people's existing and strong intrinsic motivation (i.e., their personal, internal motivation based on their own values and concerns, personal responsibility, and self-efficacy) to reduce emissions. The risk and inevitable reality is then that people at individual, community and corporate levels become dependent on ongoing payments in order to continue to reduce emissions. This is unsustainable as well as counter-productive in terms of existing psychological and pro-environmental motivations, and ultimately results in a failure to achieve the necessary long term pro-environmental engagement and behaviour change that is critical if we are to secure a safe climate for future generations.

There exists five decades of social science research addressing the relative efficacy of differing intervention strategies and government policies to do with engaging and influencing the public on sustainability issues (e.g., Gardner & Stern, 2002; Gifford, 2007, 2011a; National Research Council 1992, 1999, 2009, 2010; Steg & Vlek, 2009; Swim et al., 2011; Winter & Koger, 2004). This established body of research suggests that the Direct Action Policy initiative has poor prospects of effecting the kinds of public engagement changes required to meet the challenge of climate change. Climate policies need to build efficacy amongst individuals and groups to engage in effective actions to address climate

change. The Australian Psychological Society is concerned that the Direct Action Plan fails to build this efficacy.

6. Psychosocial impacts of the Direct Action Plan

A critical aspect of this inquiry not addressed in the Terms of Reference is the *psychosocial impacts* of the Direct Action Plan policy on the Australian public. What happens when people perceive climate policies to be transparently inadequate to succeed in limiting climate change, and to reduce the enormous threat that rising global temperatures pose to humans now and in the future?

The majority of Australians understand that climate change poses an enormous challenge, and are concerned by the scale of the threat, the size of the challenge, and the speed with which a transition to a low carbon world needs to occur.

A national survey undertaken by Griffith University psychologists and social scientists in 2010 and 2011 provides the most reliable information currently available about the Australian public's perceptions and understandings of climate change (Reser et al., 2012a, 2012b). According to their study, a large majority of Australians accept the science on climate change, that human behaviour is a causal factor contributing to rising greenhouse gas emissions, global warming, and increased climate instability (Reser, 2012a, 2012b), and that it is a serious problem. Climate change and the environment was the most frequent "serious problem facing the world in the future if nothing is done to stop it" endorsed by respondents (Reser, 2012b, p.15). This was endorsed as a problem three times as often as the next most frequently mentioned problem, overpopulation. Furthermore, more than half of the respondents said that their concerns were increasing, predominantly because of increased awareness, media coverage, lack of action by government on climate change, and the perceived increase in frequency and intensity of natural disasters and extreme weather events.

A majority of surveyed Australians also believe that the Australian Government, state governments, and corporate Australia should be addressing the environmental threat. There exists a range of ways in which people can respond to the real and perceived failure of governments to take action on large-scale problems and known threats to life. Some brief examples are outlined below.

People may feel helpless and hopeless, with these feelings themselves generating frustration, guilt, and powerlessness in the face of profound and increasingly imminent threat. This perceived lack of control is a major contributor to depression and anxiety (Seligman, 1975). When people feel such helplessness, they often simply give up, while paying very high psychological costs. Psychological strain can have widespread impacts on productivity, family

systems, workplace performance, etc. The additional psychosocial costs can be far-reaching.

Frustration can develop into anger as further climate change impacts are directly experienced in the context of heightened realisation that their government has failed to protect them. When large groups of people become angry, frustrated or depressed, there is a danger of social breakdown with family tensions and violence, and resorting to the use of alcohol, which further fuels destructive behaviour (Kessler et al., 2005).

People's distress and anxiety about the future may increase. The Griffith research program's findings (Reser et al., 2012a, 2012b) show that a significant number of surveyed Australians (20%) already experience appreciable distress when thinking about or watching media coverage of climate change and its implications.

People may lose trust in the Government, become cynical, apathetic and fed up. People actually *do* want direct action on climate change. The potential problem with a policy that uses the term direct action, but fails to deliver any real reductions in emissions, is that people get frustrated, angry and disillusioned with a Government that they perceive is failing to protect their communities, their families and future generations, from the worst impacts of climate change.

Another significant risk resulting from inadequate climate policy is that people are more likely to minimise the problem. It can be tempting to believe that, if the government isn't taking serious action, maybe the problem isn't really a problem after all. There is a sizeable literature on climate denial. Whilst robust surveys in Australia, the US and the UK all conclude that only about 5-8% of the population hold a strong scepticism or disbelief with respect to climate change (e,g., Australia: Reser et al., 2012a, 2012b; US: Leiserowitz et al., 2011; UK: Spence et al., 2010) the numbers of people who are inclined to minimise the problem of climate change or avoid thinking about it, typically because it is too threatening or too inconvenient, are considerably higher. The temptation to deny the importance of a major threat like climate change is always present, and perceived inaction, or inadequate/weak action from national or community leaders, can be an invitation for others to conclude that maybe the problem isn't as big as it really is.

The changes required to transform our way of life to a low carbon world are of such magnitude that Australians cannot afford to become demoralised, helpless and hopeless, or minimise the problem and need for action. It is important to understand that whilst members of the general public may not have the psychological resources to fully face the climate change threat because it is so frightening and brings up very strong negative emotions (Safe Climate Psychology, 2013), it is however expected that individuals in positions of political

and corporate power have the responsibility to face up to the challenges and take measures to adequately protect the public.

There are many barriers to taking action to reduce the threat of climate change and adapt to the inevitable changes (refer to the APS submission on barriers to adaptation - http://www.psychology.org.au
; also see Gifford, 2011). Barriers can be
structural, economic, cultural and psychological. The risks of inaction are manifold, with profound negative consequences for Australians.

Strong climate policies from the Australian Government are a critically important way of helping people to overcome many of these barriers so that Australia can reduce its share of global emissions and participate fairly in global efforts to keep average temperature rise to below 2 degrees. Strong climate policy doesn't just indicate to Australians that climate change is real, serious, and urgently requires action, inspiring and encouraging them to follow suit; we also send a strong global message as well. If Australia were to act with responsibility and integrity for future generations by establishing strong climate policies, we can exert influence on the developed countries similar to ourselves, and can start a chain reaction of escalating ambition. The longer we delay the inevitable, the more costly the task.

7. Conclusion

As psychologists we are concerned not just about the environmental risks and impacts of climate change, but also by the serious psychosocial and mental health consequences of Government climate policies which fail to adequately address these serious problems. Our concerns include, but are not limited to:

- The current adverse impacts and consequences of climate change, not only for Australia's natural environments and ecosystems, but for our human communities, and the manifestly greater impacts and consequences over time.
- The largely ignored psychosocial and mental health impacts of climate change.
- The ignored volume of social science research addressing the relative efficacy of differing government policies with respect to engaging and influencing the public on environmental threats and sustainability issues.
- The ignored psychosocial impacts of the Government's proposed policy response to this escalating crisis which risks eroding people's motivation and self-efficacy to take action on climate change. A weak policy response also risks building their cynicism, loss of trust, and cumulative anger and frustration with the lack of effective action on climate change, and indeed with the perceived broader failures of their elected leaders to act in the long-term interests of current and future generations.

The individual and collective psychosocial impacts will ultimately manifest themselves in terms of a greatly altered and diminished quality of life as well as environmental quality, and the myriad psychological and social costs of living under the shadow of an ongoing environmental stressor such as climate change. These impacts will inevitably and disproportionally exacerbate the influence of multiple other environmental stressors. Hopefully this Inquiry will address these profoundly concerning issues.

An effective Climate Change Direct Action Plan needs to be both genuine in reducing pollution and greenhouse gas emissions AND also factor in the real costs of relevant issues such as health and the impacts on the community.

8. References

BoM (Bureau of Meteorology) (2014). Annual climate statement 2013 (issued Friday 3 January 2014). Retrieved from http://www.bom.gov.au/climate/current/annual/aus/2013/

Bandura, A. (1997). Self-*efficacy: The exercise of personal control*. Freeman, New York.

Bandura, A. (2006). Going global with social cognitive theory: From prospect to paydirt, in Donaldson, SI, Berger, DE & Pezdek, K (eds), A*pplied psychology: New frontiers and rewarding careers*. Lawrence Erlbaum. NJ, 53-79.

Burt, E., Orris, P., & Buchanan, S. (2013). *Scientific Evidence of Health Effects from Coal Use in Energy Generation*. Literature review published by Health Care Without Harm and University of Illinois.

Carbon Tracker (2012). *Unburnable Carbon – Are the world's financial markets carrying a carbon bubble*? Retrieved from http://www.carbontracker.org/

Carver, C.S. & Scheier, M.F. (1998). *On the self regulation of behaviour*. New York. Cambridge University Press.

Climate Commission (2011). The Critical Decade: Extreme Weather. Retrieved from www.climatecommission.org.au

Climate Change Authority (2013). Reducing Australia's Greenhouse Gas Emissions: Targets and Progress Review Draft Report 12. CCA, Melbourne: CCA.

Costello, A. et al. 2009 Managing the health effects of climate change: Lancet and University College London Institute for Global Health Commission. *Lancet*, 373, 1693–1733. (doi:10.1016/S0140-6736(09)60935-1).

DARA (2012). Climate Vulnerability Monitor Second Edition: Cold Calculus for a Hot Planet. Retrieved from http://daraint.org/climate-vulnerability-monitor/climate-vulnerability-monitor-2012/ (Report commissioned by 20 governments detailing costs of failure to act on climate change - cost to

global economy $1.2 trillion annually, responsible for 400,000 deaths each year, costs expected to double over next two decades).

Deci, E.L. & Ryan, R.M. (Eds) (2002). *Handbook of self-determination research.* Rochester, NY: University of Rochester Press.

Deci, E.L. et al (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin*, 125, 627-668.

Doherty, T. J., & Clayton, S. (2011). The psychological impacts of climate change. *American Psychologist,* 64 (4) 265-276.

Fritze, J. G., Blashki, G. A., Burke, S. & Wiseman, J. (2008). Hope, despair and transformation: Climate change and the promotion of mental health and wellbeing. *International Journal of Mental Health Systems, 2,* 13. Retrieved April 30, 2009, from http://ijmhs.com/content/2/1/13

Gardner, G. T., & Stern, P. C. (2002). *Environmental problems and human behavior* (2nd ed.). Boston, MA. Pearson Custom Publishing.

Gardner, G. T., & Stern, P. C. (2008). The short list: Most effective actions U.S. households can take to limit climate change. *Environment, 50,5,* 13-24.

Garnaut, R. (2011). Garnaut Climate Change Review – Update 2011: Australia in the Global Response to Climate Change. Retrieved from http://www.garnautreview.org.au/update-2011/garnaut-review-2011/summary-20June.pdf

Gifford, R. (2011a) Behavioral dimensions of climate change: Drivers, responses, barriers, and interventions. *WIREs Climate Change, 2,* 6, 801-827.

Gifford, R. (2007). *Environmental psychology: Principles and practice*. Coleville, WA: Optimal Books.

Gifford, R. (2011b). The dragons of inaction: Psychological barriers that limit climate change and adaptation. *American Psychologist,* 66 (4) 290-302.

Hansen, J. & Sato, M. (2011). Paleoclimate Implications for Human-Made Climate Change. NASA Goddard Institute for Space Studies and Columbia University Earth Institute, New York. Retrieved from http://www.columbia.edu/~jeh1/mailings/2011/20110118_MilankovicPaper.pdf.

Hare, W.L. (2009). A Safe Landing for the Climate. In L.Starke (Ed.), *State of the World 2009: Into a Warming World* (pp.13-29). Washington: Worldwatch Institute.

Kessler, R.C., Chiu, W.T., Demler, O., Merikangas, K.R., Walters, E.E. (2005). Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry,* 62(6), 617-27.

Leiserowitz, A., Maibach, E., Roser-Renouf, C., Smith, N., & Hmielowski, J. D. (2011). Climate change in the American mind: Americans' global warming beliefs and attitudes in November 2011. Yale University and George Mason University. New Haven, CT: Yale Project on Climate Change Communication. Retrieved from

http://environment.yale.edu/climate/files/ClimateBeliefsNovember2011.pdf.

Meinshausen, M. et al. (2009). Greenhouse-gas emission targets for limiting global warming to 2 degrees Celsius. *Nature*, 30, 1158.

National Research Council (1992). *Global environmental change: Understanding the human dimensions*. Washington, DC: National Academy Press.

National Research Council. (1999). *Global environmental change: Research pathways for the next decade*. Washington, DC: National Academy Press.

National Research Council. (2009). *Understanding and responding to climate change*. Washington, DC: National Academy Press.

National Research Council. (2010a). *Advancing the science of climate change*. Washington, DC: National Academy Press.

Pearman, G. (2008). Climate change risk in Australia under alternative emissions futures, Report prepared by Graeme Pearman Consulting Pty Ltd for the Australian Government, Treasury, Canberra.

Reser, J.P., Bradley, G.L., Glendon, A.I., Ellul, M.C., & Callaghan, R. (2012a). Public risk perceptions, understandings and responses to climate change in Australia and Great Britain. Gold Coast, Qld: National Climate Change Adaptation Research Facility. www.nccarf.edu.au/publications/public-risk-perceptions-final

Reser, J.P., Bradley, G.L., Glendon, A.I., Ellul, M.C., & Callaghan, R. (2012b). Public risk perceptions, understandings and responses to climate change and natural disasters in Australia: 2010-2011 national survey findings. Gold Coast, Qld: National Climate Change Adaptation Research Facility. www.nccarf.edu.au/publications/public-risk-perceptions-second-survey

Reser, J.P. & Swim, J.K. (2011). Adapting and coping with the threat and impacts of climate change. *American Psychologist*, 66 (4) 277-289.

Reser, J. P., Morrissey, S. A., & Ellul, M. C. (2011). The threat of climate change: Psychological response, adaptation, and impacts. In I. Weissbecker (Ed.), *Climate change and human well being*. International and cultural psychology series (pp. 19-42). New York: Springer Publications.

Reser, J.P. & Bentrupperbäumer, J.M. (2001). Reframing the nature and scope of social impact assessment: A modest proposal relating to psychological and social (psychosocial) impacts. In A. Dale, N. Taylor, & M. Lane (Eds.) *Social assessment in natural resource management institutions* (pp. 106-122). Collingwood, Victoria: CSIRO Publications.

Safe Climate Psychology (2013). *Let's speak about climate change*. Published by Psychology for a safe climate, Melbourne.

Schellnhuber, H.J. et al., (2012). Turn Down the Heat. A Report for the World Bank by the Potsdam Institute for Climate Impact Research and Climate Analytics. The World Bank, Washington. http://community-wealth.org/sites/clone.community-wealth.org/files/downloads/report-schellnhuber-et-al.pdf

Seligman, M. E. P. (1975). *Helplessness: On Depression, Development, and Death*. San Francisco: W. H. Freeman.

Spence, A., Venables, D., Pidgeon, N., Poortinga, W., & Demski, C. (2010). Public perceptions of climate and energy futures in Britain: Summary findings of a survey conducted from January to March 2010. Understanding Risk working paper 10-01. Cardiff, UK: Understanding Risk Research, Cardiff University.

Steg, L., & Vleck, C. (2009). Encouraging pro-environmental behaviour. An integrative review and research agenda. *Journal of Environmental Psychology, 29*, 309-317.

Swim, J., Clayton, S., Doherty, T., Gifford, R., Howard, G., Reser, J., Stern, P. & Weber, E. (2011). Psychological Contributions to Understanding and Addressing Global Climate Change. *American Psychologist*, 241-250.

The Climate Institute (2013). Coalition Climate Policy and the National Climate Interest. Report published by the Climate Institute. Sydney. http://www.reputex.com

Winter, D.N. & Koger, S.M. (2004). *The psychology of environmental problems. Second edition.* Mahwah, NJ. Lawrence Erlbaum.

WMO (2013). Warmest November on Record. World Meteorological Organization Retrieved from https://public.wmo.int/en

8. Appendix

Current climate threats and impacts

Last year was the hottest Australian year on record (BoM, 2014), and globally, nine of the ten warmest years have occurred in the past 12 years (WMO, 2013). With less than one degree of warming, extreme weather events provide evidence that climate change is already impacting severely (Climate Commission, 2011). It is already too hot. Current predictions, based on business as usual, have the world on track for an additional 4-6 degrees warming by the end of this century (Schellnhuber et al., 2012).

For Australia, rising temperatures mean a range of profoundly negative impacts across a range of systems, including: loss of coral reef and alpine environments; major incursions of pests, weeds and diseases; dangerous water shortages; coastal inundation and erosion requiring abandonment of some coastal developments or the construction of sea walls; substantially reduced agricultural production; risks to human life from extreme weather events; disease; major destruction of infrastructure from flooding, soil erosion, siltation, inappropriate infrastructure, loss of livestock, crops, and human life; significant international

pressures, increased regional conflict, demand for humanitarian aid and increased migration (Pearman, 2008).

"Health scientists are predicting that climate change will increase a variety of health conditions including asthma, infectious diseases, virulent allergens, along with medical emergencies associated with heat stress, the spread of water- and vector-borne diseases and increased injury from severe weather events" (http://climatecommission.org.au)
Climate change is a leading global cause of death (DARA, 2012).

Australia by some standards is the world's biggest emitter of carbon dioxide on a per-capita basis (http://www.ucsusa.org/global_warming/science_and_impacts/science/each-countrys-share-of-co2.html), and if proposed exports of coal were included in total national emissions accounts, Australia could account for 42-75% of the total global carbon budget (Carbon Tracker, 2012).

Necessary action to mitigate the threat of climate change

Australia has participated in global agreements that global warming should be limited to below $2^{O}C$ above pre-industrial average global temperatures, with periodic review to consider strengthening this long-term goal, including limiting temperature rise to $1.5^{0}C$ (Garnaut, 2011). Australia must therefore participate fairly in collective global action to put the world on a path to avoid an increase in global temperature of 2°C above pre-industrial levels.

It is evident moreover that we need to return to below 350 ppm of carbon dioxide to limit warming to well below $2^{O}C$, in light of considerable scientific evidence that even a "warming of 2 degrees Celsius poses unacceptable risks to key natural and human systems. It is clearly not 'safe' and would not prevent, with high certainty, dangerous interference with the climate system" (Hare, 2009, p.19). As the safe limit on atmospheric carbon dioxide is below the current level of 400ppm, we need to reduce our net emissions to zero and find safe ways to draw down excess greenhouse gases from the atmosphere, leave fossil fuels in the ground and transition rapidly to a zero emissions economy.