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Climate Change in the Asia-Pacific Region: Security Implications for Australia

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Abstract

This paper evaluates the implications of climate change in the Asia-Pacific region with a particular focus on how this will affect Australia's security interests. Commencing with a brief theoretical appraisal of the topic, it raises a range of inter-related environmental security issues, such as climate change and resource scarcity arguing that these are major security concerns. The paper does not engage with Australia's role in the environmental debate,¹ rather it engages with how the wide-ranging security impacts associated with climate change will affect the people and countries in Australia's immediate geographic region. Projecting dismal scenarios, the paper argues that addressing this topic through existing diplomatic mechanisms is of crucial interest to regional stability, and therefore also Australia's national security.

This document is approximately 5,000 words, excluding its bibliography and abstract. It prints off at 21 pages.

¹ Editor's note. The original paper contained a significant section on Australia and particularly greenhouse gas emissions. With the election of the Rudd government in late 2007, Australia signed the Kyoto Protocol and made a number of other commitments to domestic environment issues. As such, this section of the essay became dated and it was decided to edit the paper to have a focus on the Asia-Pacific region and Australia's future relationships with these countries.

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Introduction

This paper evaluates the implications of environmental change in the Asia-Pacific region with a particular focus on how this will affect Australia's security interests. The paper argues how and why a range of environmental issues are security concerns for this region, and although it forecasts an unhappy scenario, it also suggests ways in which Australia can work through existing mechanisms to help ameliorate the worst effects of regional environmental insecurity.

Climate Change and Security

Although some uncertainty remains as to the exact scope and rate of global climate change over the coming decades, particularly at the regional and local level, there can be little doubt that the atmosphere is already warming and will continue to warm substantially throughout the 21st Century. Furthermore, the majority of this warming effect and associated climate changes are attributable to human rather than natural causes.² However, climate change is more than an environmental issue. It requires preventative and mitigatory action at a global level to reduce current and future climatic degradation. It also demands effort to identify and prepare for any domestic and international security issues arising from its effects.³ Climate change poses a range of threats that arguably have a security dimension and these can be analysed to determine the range of security considerations that may need to be addressed by policymakers. However, to facilitate a meaningful discussion of these matters, an appropriate theoretical context for climate change as an environmental security issue within the broader national and international security framework will need to be established.

Environmental Security

Since the 1980s, environmental security has increasingly been recognised as a distinct form of security alongside other broadly accepted 'non-traditional' forms such as human, economic and energy security.⁴ Although security defies a common definition, Buzan concluded that it is essentially 'the pursuit of freedom from threat.'⁵ Further, based on an understanding of the environment as referring to the biosphere, environmental security can be broadly defined as 'the relative safety from environmental dangers... originating within or across borders'.⁶ However, two different interpretations of this conceptual definition have emerged in both theory and practice. The first of these

2 Ministry of Defence, *The DCDC Global Strategic Trends Programme 2007 – 2036*, British Government, 3rd ed., Development Concepts and Doctrine Centre, January 2007, available at: <<http://www.mod.uk>>, accessed 22 May 2007.

3 'A Warmer World is Ripe for Conflict and Danger.' *Financial Times (London)*, 24 January 2007.

4 Philip Winter, *The East Asian Environmental Situation: Problems and Prospects*. Australian Defence College Monograph Series, No. 7, 2004, p. 11.

5 Barry Buzan, *People, States and Fear: An Agenda for International Security Studies in the Post-Cold War Era*. 2nd ed. Harvester Wheatsheaf, Hemel Hempstead: 1991, p. 18.

6 Millennium Project, *Executive Summary, Environmental Security Study; Emerging International Definitions, Perceptions, and Policy Considerations*, Millennium Project, available at: <<http://www.millennium-project.org/millennium/es-exsum.html>>, accessed 21 May 2008.



interpretations places emphasis on securing ecosystems and ecological processes, and is most commonly applied in the context of issues requiring a multilateral or international approach. This version of environmental security can be referred to as a 'securing-the-environment' approach. The second approach is based on assuring the physical security or defence of natural resources at the domestic or national level⁷ and can be usefully summarised using the term 'environment-as-security'.

'Realist' and 'liberalist' theories of international relations lie at the heart of these alternative interpretations. Securing-the-environment is consistent with the essential 'liberalist' philosophy of seeking to address transnational issues through greater international cooperation. Despite realist assertions that this liberal approach has achieved little, the degree of cooperation by countries in relation to environmental issues has been significant as evidenced by the number of United Nations guidelines, charters and conventions that have been voted into existence. Although many of these international initiatives still lack decisive support,⁸ the degree of dialogue and debate that has occurred, and is still occurring, in relation to the environment, indicates that the concept of environmental security has gained considerable and growing traction in the international arena.

The environment-as-security approach on the other hand, is more directly influenced by the realist philosophy of maximising state power through the threat of force. To a realist, the environment is simply one of many challenges to be addressed within a more 'traditional' national security-based paradigm. Rather than being a major cause of conflict in their own right, environmental factors are viewed as contributory stressors that interact with mainstream security issues to exacerbate underlying tensions and increase the potential for conflict.⁹ This viewpoint is supported by research conducted in the 1990s, which found that environmental issues have rarely been a direct cause of interstate conflict.¹⁰ The environment-as-security concept therefore remains highly contestable.

Another key aspect of establishing a challenge like climate change as a valid environmental security issue is whether or not it justifies the application of extraordinary measures by states in responding to it. This process is known as 'securitisation' and is an essential precursor in motivating states to take whatever drastic action may be required to overcome the issue in question.¹¹ To be successfully 'securitised', an issue generally needs to be large-scale, complex, high impact, urgent and/or long-term in nature, significantly irreversible and difficult to measure. Against these general criteria, climate

⁷ Jon Barnett, *The Meaning of Environmental Security: Ecological Politics and Policy in the New Security Era*, Zed Books, London and New York: 2001, pp. 108-109.

⁸ Philip Winter, *The East Asian Environmental Situation*. p. 14.

⁹ Philip Winter, *The East Asian Environmental Situation*. pp. 13-16.

¹⁰ Jon Barnett, *The Meaning of Environmental Security: Ecological Politics and Policy in the New Security Era*. Zed Books, London and New York: 2001.p. 62.

¹¹ Jon Barnett, *The Meaning of Environmental Security*. p. 25.



change presents as a highly complex issue that is difficult to measure but will almost certainly produce very severe and potentially irreversible global consequences that will endure for centuries. Climate change is therefore a valid environmental security issue requiring forthright action and prioritisation in relation to other significant international and national security issues. However, as an environmental issue it will also produce, as a secondary effect, a range of more traditional security concerns.

Climate Change Threats

Some analysts consider that the risk of abrupt climate change could overwhelm the capacity of states and populations to adapt. This will increase significantly should the global average surface temperature reach 2 to 2.5 degrees celsius above the pre-industrial revolution level.¹² However, holding warming below this level will require annual global carbon dioxide emissions to flatten-out at around current amounts by 2015 or so, with further steady reductions of 70% on present levels by the end of the century.¹³ Continued global warming will also present threats more generally to the security of states and populations through changing weather patterns, rising sea levels and extreme weather events.

Changing weather patterns are expected to result in more frequent hot extremes, heat waves and heavy precipitation events. Precipitation will most likely increase at high latitudes, but decrease in sub-tropical and tropical regions with periods of more intense precipitation generally being interspersed with longer dry periods. As a result, both droughts and flooding can be expected to increase in frequency, duration and extent.¹⁴ Glaciers and snow cover are also expected to decline with ramifications for water availability in areas reliant on meltwater from mountain ranges. Transmission of diseases such as malaria, dengue fever and cholera is also likely to increase with increased temperature.¹⁵ After initial improvements in some areas, crop productivity across the globe will decrease as local average temperatures rise,¹⁶ although decreased yields may be at least partially offset by the potential for new regions such as Canada, Siberia, Greenland, Scandinavia and Alaska to be opened up to agriculture in a warmer world.¹⁷ Potentially new economic opportunities could also be created should the Arctic ice cap continue to melt by opening up the polar seas to container vessels and reducing

12 United Nations Foundation, *Confronting Climate Change: Avoiding the Unmanageable, Managing the Unavoidable*. United Nations Foundation, Washington, DC, February 2007, p. 5, available at <http://www.unfoundation.org/files/pdf/2007/SEG_Report.pdf>, accessed 2 May 2007.

13 United Nations Foundation, *Confronting Climate Change*. pp. 3–5.

14 Intergovernmental Panel on Climate Change - Working Group I, *Climate Change 2007: The Physical Science Basis*, p. 783.

15 Intergovernmental Panel on Climate Change – A Special Report of IPCC Working Group II, *The Regional Impacts of Climate Change – An Assessment of Vulnerability*, November 1997, available at <<http://www.grida.no/climate/ipcc/regional/256.htm>-<<http://www.grida.no/climate/ipcc/regional/257.htm>>, accessed 7 June 2007.

16 Intergovernmental Panel on Climate Change - Working Group II, *Climate Change 2007: Impacts, Adaptation and Vulnerability*. pp. 5 – 6, available at: <<http://www.ipcc-wg2.org/index.html>>, accessed 2 May 2007.

17 Gregg Easterbrook, *Global Warming: Who Loses – And Who Wins?* The Atlantic Monthly, April 2007, pp. 56-57.



the costs of shipping between Asia, Europe and the east coast of the United States.¹⁸

Rising sea levels will inundate coastal land and render it unusable for habitation or agriculture. Low-lying countries such as Bangladesh, the Maldives and some of the small island states of the South West Pacific are particularly at risk. Even major cities on waterways like Amsterdam, London, Mumbai, Hong Kong, New York and many others, will be threatened. Deeper coastal waters resulting from coastal inundation will cause inland and upstream salinity intrusion, which will affect wetlands and the fertility of large areas of low-lying cultivated land located near the sea.¹⁹ These effects are likely to be further compounded by storm surges in affected areas.²⁰ Fish species could also migrate or become more unpredictable in their movements should changes in ocean currents occur.²¹ The millions of people from developed and developing countries that live and work in coastal areas will be directly impacted by this threat.²²

Extreme weather events in the form of tropical cyclones and severe storms are also expected to become more intense on average with higher wind speeds and heavier rainfall. Historical data indicates that this process of intensification may already be underway as the average annual number of category 4 and 5 cyclones has steadily increased over the last 30 years.²³ Despite this increase, the overall number of tropical cyclones per year is projected to decrease due to a significant reduction in the number of weaker storms. This trend is also reflected in the analysis of storms that occur outside the tropics. Storm tracks in both the northern and southern hemispheres are also projected to expand a few degrees of latitude towards the poles.²⁴ Increased storm intensity and range will cause greater destruction of infrastructure and crops, loss of life, and damage and disruption to the economies of affected countries.²⁵

Security Concerns

Clearly, the most effective way to ameliorate the threats posed by climate change is to stabilise and reduce the level of greenhouse gases in the atmosphere. From a security perspective, this result can only be achieved through a co-operative international response that can rapidly agree to, and implement, fundamental and inherently inequitable political, social and economic reform on a global scale.²⁶ Essentially, this

18 Gregg Easterbrook, *Global Warming: Who Loses – And Who Wins?* pp. 60-62.

19 David Seddon, 'Insecure Environment: International Implications of Climate Change.' *Jane's Intelligence Review*, May 2007, p. 8.

20 *National Security and the Threat of Climate Change*, CNA Corporation, Alexandria, Virginia, 2007, p. 16, available at: <<http://www.securityandclimate.cna.org/report/National%20Security%20and%20the%20Threat%20of%20Climate%20Change.pdf>>, accessed 3 May 2007.

21 Alan Dupont and Graeme Pearman, *Heating up the Planet; Climate Change and Security*. Lowy Institute Paper 12, Longueville Media, Double Bay NSW: 2006, p. 31.

22 Intergovernmental Panel on Climate Change - Working Group II, *Climate Change 2007: Impacts, Adaptation and Vulnerability*. p. 7.

23 Intergovernmental Panel on Climate Change - Working Group I, *Climate Change 2007: The Physical Science Basis*. p. 783.

24 Intergovernmental Panel on Climate Change - Working Group I, *Climate Change 2007: The Physical Science Basis*. p. 783.

25 Will Steffen, *Stronger Evidence but New Challenges: Climate Change Science 2001 – 2005*. Australian Greenhouse Office, 2006, available at: <<http://www.greenhouse.gov.au/science/publications/pubs/science2001-05.pdf>>, accessed 3 May 2007, pp. 12–13.

26 Australian Bureau of Agricultural and Resource Economics (ABARE) and Department of Foreign Affairs and Trade 1995, *Global Climate Change: Economic Dimensions of a Cooperative International Policy Response beyond 2000*. ABARE, 1995, p. 21.



would be securitisation of environmental issues. However, serious international debate and preliminary action to address this complex issue has only recently begun.²⁷ In the meantime, a number of lower-order security concerns arising from the current and future effects of climate change will also require the attention of international and national policymakers.

Stable modern human societies need access to the key resources of water, food and energy, and lack of any one of these can contribute to or cause conflicts.²⁸ By 2025, an estimated half a billion people will suffer from climate change-induced water shortages as a result of changes in rainfall patterns, glacial melting and saltwater intrusion into coastal water supplies.²⁹ Yields from agriculture and fisheries are also likely to reduce substantially due to rising temperatures, rainfall shifts, the inundation or salinisation of coastal land, unpredictable changes in ocean currents, and increased frequency of extreme weather events.³⁰ Existing energy-related tensions in areas such as the South China Sea could also be exacerbated, particularly if key objects at the heart of territorial and resource claims are swallowed by rising sea levels.³¹ Moreover, the possibility of new oil or gas discoveries beneath the melting arctic ice could provide a basis for new tensions.³²

Another significant security concern that can be caused, or contributed to, by climate change is mass migration. The reasons underlying large-scale population movements can be complex, but regardless of the cause, they are almost always highly disruptive to the states and populations involved through the creation or exacerbation of urban overcrowding, ethnic or religious friction, and border tensions. Climate change-related triggers for such movements could include protracted droughts, large scale flooding as a result of precipitation events or sea level rise, and weather-related natural disasters.³³

Estimates of the global economic damage caused by climate change are highly assumption-dependent. Although the evidence indicates that such financial costs are likely to be significant and to increase over time, it is also clear that costs across different population groups may vary considerably from the aggregated average. These costs are likely to be larger amongst more highly exposed and less adaptable groups³⁴ such as poor communities that are often located in high-risk areas and rely heavily on climate-sensitive resources or industries such as agriculture, fisheries and tourism.³⁵ Natural disasters are particularly damaging economically and can stretch the coping resources

27 David Seddon, 'Insecure Environment.' p. 7.

28 Alan Dupont and Graeme Pearman, *Heating up the Planet*. p. 80.

29 Alan Dupont and Graeme Pearman, *Heating up the Planet*. p. 33.

30 Alan Dupont and Graeme Pearman, *Heating up the Planet*, pp. 30-33.

31 Alan Dupont and Graeme Pearman, *Heating up the Planet*. pp. 80-81.

32 Gregg Easterbrook, *Global Warming: Who Loses – And Who Wins?* p. 62.

33 David Seddon, 'Insecure Environment.' p. 10.

34 Intergovernmental Panel on Climate Change - Working Group II, *Climate Change 2007: Impacts, Adaptation and Vulnerability*. p. 16.

35 Intergovernmental Panel on Climate Change - Working Group II, *Climate Change 2007: Impacts, Adaptation and Vulnerability*. pp. 6-7.

of even the wealthiest nations.³⁶ Significant spreading of traditionally 'tropical' vector-borne diseases such as dengue fever and malaria, and food-borne diseases such as salmonellosis as a result of climate change is also of major concern. For example, mathematical modelling predicts that a mean temperature rise of three degrees celsius would result in between 50 and 80 million additional malaria cases worldwide, primarily through the expansion of mosquito habitats.³⁷

Another aspect of climate change is its potential to contribute to the decline of fragile or failed states and the growth of terrorism, particularly where the states in question are already weak. Economic damage, resource depletion, and the high costs of mitigating climate change, combined with tensions along tribal, ethnic, religious, separatist or ideological lines will significantly undermine the capacity of such states to regulate, manage and control conflict.³⁸ These factors also perpetuate the conditions of poverty, forced migration and unemployment that provide growth and recruitment opportunities for terrorist organisations.³⁹ In a disturbing trend, some environmental extremist groups have carried out significant terrorist acts in the United States and Europe in 'defence' of the environment.⁴⁰

Impacts in the Asia-Pacific Region

The Asia-Pacific region is home to countries and populations that extend across the full spectrum of human and industrial development. In general, the pressures on natural resources and the environment associated with rapid urbanisation, industrialisation and economic development will be exacerbated by the impacts associated with climate change, with this effect increasing in severity the poorer the country.⁴¹ This is also true of many small South-West Pacific island states where existing environmental degradation effects such as marine pollution or denuded natural resources are likely to compound significantly the anticipated impacts of climate change.⁴² Major emerging economies such as China are also likely to be severely affected, but they will be able to afford and implement adaptive responses to minimise or reduce adverse impacts. While the more developed countries such as Japan and Australia are best placed to respond effectively to the challenges of unavoidable climate change,⁴³ flow-on effects from countries which are not as able to deal quickly and effectively with the affects of climate change are

36 Hurricane Katrina, which devastated southern cities and states in the USA in 2005, provides a good example to illustrate this point, noted by Alan Dupont and Graeme Pearman, *Heating up the Planet*. p. 81.

37 Intergovernmental Panel on Climate Change, *The Regional Impacts of Climate Change*. Available at: <<http://www.grida.no/climate/ipcc/regional/256.htm>>, accessed 29 April 2007.

38 David Seddon, 'Insecure Environment.' pp. 11-12.

39 *National Security and the Threat of Climate Change*, p. 17.

40 See for example Daphne Biliouri, 'Eco-Protest Develops More Militant Edge.' *Jane's Intelligence Review*, 1 October 2001, pp. 18-20.

41 Intergovernmental Panel on Climate Change - Working Group II, *Climate Change 2007: Impacts, Adaptation and Vulnerability*. p. 8.

42 John E Hay and Graham Sem, *Vulnerability & Adaptation – Evaluation and Regional Synthesis of National Assessments of Vulnerability and Adaptation to Climate Change*, South Pacific Regional Environment Programme, Apia, Samoa, March 2000, p. iv, available at: <http://www.sprep.org/att/publication/000495_VA_Regional_synth.pdf>, accessed 6 June 2007.

43 David Seddon, 'Insecure Environment.' p. 12.



likely to be unavoidable.

Changing Weather Patterns in Asia

All of Asia is expected to become warmer over the period 1999 to 2099 with a projected increase in mean temperature of 2.5 degrees celsius for South-East Asia, which is about the expected global mean. The projection for East Asia is significantly higher at 3.3 degrees,⁴⁴ which will mean fewer very cold days and longer, hotter and more frequent summer heat waves in this region of the continent. Annual precipitation will also increase overall, but particularly so in East Asia as a result of more frequent and heavier rain falls.⁴⁵ Greater variability in the monsoon cycle and increased El Nino effects will heighten flood and drought intensity and contribute to declines in agricultural productivity by as much as 20% in a region that is more dependent than any other on rice and cereals to feed its populations.⁴⁶ Temperature increases that cause both major migrations of fish, and their die-off, compound the problem further for the estimated one billion Asians who rely on fish as their primary source of protein.⁴⁷ These effects are already manifesting within the region with some Indonesian farmers claiming to have lost 25% to 40% of their income due to irregular rainfall, and fishermen in the Maluku Islands of Indonesia complaining of poor catches as they lose their ability to predict sea climate and fish movements.⁴⁸

In addition to the warmer and wetter conditions that will favour the spread of vector-borne diseases such as malaria and dengue, there will also be an increase in the risk of water-borne disease and exposure of more areas to the risk of epidemics.⁴⁹ The prevalence of and number of deaths from diarrhoeal disease is also expected to rise, primarily as a result of changes in the frequency and intensity of floods and droughts.⁵⁰

Forty percent of the world's population, including hundreds of millions of Asians, relies on the summer meltwater from mountain glaciers to provide much of their drinking water requirements. However, these glaciers are shrinking and could disappear altogether in the coming decades. With several of Asia's major rivers, including the Mekong, Yangtze and Yellow Rivers, originating in the Himalayas and fed by glacier melt, freshwater availability in Asia will have drastically reduced by 2050,⁵¹ with China, Thailand, Laos, Cambodia, and Vietnam likely to be affected most.⁵² In the shorter term though, melting Himalayan ice is filling existing lakes rapidly to bursting point and is threatening to destroy fragile ecosystems and mountain communities located in likely

44 Intergovernmental Panel on Climate Change - Working Group I, *Climate Change 2007: The Physical Science Basis*. p. 881.

45 Intergovernmental Panel on Climate Change - Working Group I, *Climate Change 2007: The Physical Science Basis*. p. 879.

46 Alan Dupont and Graeme Pearman, *Heating up the Planet*, p. 29.

47 Alan Dupont and Graeme Pearman, *Heating up the Planet*, pp. 29-31.

48 Abdul Khalik, 'Climate Change Already Hitting RI's Poorest.' *The Jakarta Post*, 11 June 2007, p. 3.

49 *National Security and the Threat of Climate Change*, p. 27.

50 Intergovernmental Panel on Climate Change - Working Group II, *Climate Change 2007: Impacts, Adaptation and Vulnerability*. p. 9.

51 *National Security and the Threat of Climate Change*, p. 15.

52 Alan Dupont and Graeme Pearman, *Heating up the Planet*. p. 35.



flood paths.⁵³ By 2025, large parts of China will have already been classified as 'water scarce'⁵⁴ due to shortfalls in freshwater resources due to glacial melt, changes in rainfall patterns, desertification and other climate change effects. More than one billion people in Asia are expected to be directly affected by water shortages due to climate change by 2050.⁵⁵

In combination with other challenges such as rapid population growth, urbanization, industrialization and economic development, the effects of changing weather patterns will significantly increase pressure on natural resources and sustainable development for the developing countries and poorer populations of Asia.⁵⁶

Changing Weather Patterns in Oceania

Projected mean temperature increases for the countries of Oceania over the period from 1999 to 2099 are; 2.6 degrees Celsius for southern Australia, which is slightly higher than the expected global mean, 3.0 degrees for northern Australia, within the range of 0.5 to 3.5 degrees for New Zealand,⁵⁷ and somewhat below the global average at 1.8 degrees for the islands of the South-West Pacific.⁵⁸ As a result, Australia and New Zealand will experience more frequent extreme high daily temperatures and fewer days of extreme cold, while the Pacific Islands will be generally cooler. Precipitation is likely to decrease in southern Australia elevating the risk of drought, whereas northern Australia will tend towards more frequent daily extremes of rain. In New Zealand on the other hand, rainfall will be greater in the South Island but most likely reduce over the North Island.⁵⁹ Mean wind speed is also expected to increase over the South Island, particularly in winter⁶⁰ while annual precipitation in the southern Pacific will also increase.⁶¹

Reduced precipitation and increased evaporation will combine to magnify water security problems in some parts of Australia and New Zealand by the 2030 timeframe.⁶² Australia's relatively low latitude, scarce water resources, and reliance on crops that are presently growing near or above their optimum temperatures, render it more vulnerable to climate change than New Zealand. As 'a cooler, wetter, mid-latitude country', New Zealand will have more opportunity to benefit from the ready availability of suitable crops and a likely increase in agricultural production.⁶³ In Australia, southwards

53 David Seddon, 'Insecure Environment'. p. 7.

54 *National Security and the Threat of Climate Change*. p. 15

55 Intergovernmental Panel on Climate Change - Working Group II, *Climate Change 2007: Impacts, Adaptation and Vulnerability*. p. 8.

56 Intergovernmental Panel on Climate Change - Working Group II, *Climate Change 2007: Impacts, Adaptation and Vulnerability*. pp. 8-9.

57 Intergovernmental Panel on Climate Change - Working Group I, *Climate Change 2007: The Physical Science Basis*, pp. 899-900.

58 Intergovernmental Panel on Climate Change - Working Group I, *Climate Change 2007: The Physical Science Basis*. p. 913.

59 Intergovernmental Panel on Climate Change - Working Group I, *Climate Change 2007: The Physical Science Basis*. p. 896.

60 Intergovernmental Panel on Climate Change - Working Group I, *Climate Change 2007: The Physical Science Basis*. p. 896.

61 Intergovernmental Panel on Climate Change - Working Group I, *Climate Change 2007: The Physical Science Basis*. p. 914.

62 Intergovernmental Panel on Climate Change - Working Group II, *Climate Change 2007: Impacts, Adaptation and Vulnerability*. p. 9.

63 Intergovernmental Panel on Climate Change, *The Regional Impacts of Climate Change*. Available at: <<http://www.grida.no/climate/ipcc/regional/060.htm>>, accessed 29 April 2008.



expansion of endemic viruses such as Murray Valley Encephalitis and Ross River Virus, have already been linked with climate variability.⁶⁴

For the Pacific Islands, prolonged temperature rise could cause coral reefs to bleach and die. Elevated temperatures can also contribute to reduced crop yields, and affect clam and sea turtle fisheries, as well as fish stocks in shallow lagoons.⁶⁵ Healthy coral reefs are essential to the well-being of many of the island states of the South-West Pacific as they provide a buffer against coastal erosion, a home for the fish that sustain the population, and carbonate sand for the beaches that attract tourists. Existing environmental degradation and temperature rise through climate change pose a serious threat to the ecological viability of these reefs in the longer term and therefore to the economic health of these small nations.⁶⁶

Rising Sea Levels

Over the period 1999 to 2099, global mean sea level is projected to rise by 0.18 to 0.59 metres.⁶⁷ However, this will not be uniform across the Asia-Pacific due to variations in the uptake of heat by the ocean at a regional level, changes in atmospheric and oceanic circulation, and vertical land movements.⁶⁸ The majority of Asia's most densely populated and productive areas, including the cities of Shanghai, Tianjin, Guangzhou, Hong Kong, Tokyo, Jakarta, Manila, Bangkok, and Singapore, are located on or near the coast and along the banks of economically important rivers and deltas. In all, almost 40% of a total population of four billion Asians live within 72 kilometres of the 208,000 kilometre long Asian coastline.⁶⁹ As sea levels rise, these areas will be subjected to large-scale saline contamination of ground water, inundation of river deltas and valleys, and the destruction of farmlands. Areas under greatest threat include; the Yellow and Yangtze River deltas of China, Manila Bay in the Philippines, low-lying coastal fringes of Sumatra, Kalimantan and Java in Indonesia, the Mekong delta in Vietnam and the Chao Phraya delta in Thailand.⁷⁰ By 2050 up to 150 million people may be displaced worldwide as a result of global warming, with most of these in Asia.⁷¹ In addition to these population displacements and economic impacts, existing resource-related tensions in the South China Sea could also be exacerbated if key rocks or reefs at the heart of the various territorial and resource claims become submerged.⁷²

64 R.N. Jones, A.B. Pittock and P.H. Whetton, 'The Potential Impacts of Climate Change' in *Climate Change in the South Pacific: Impacts and Responses in Australia, New Zealand, and Small Island States*, Alexander Gillespie and William C.G. Burns (eds), Kluwer, Dordrecht: 2000, p. 25.

65 William C.G. Burns, 'The Impact of Climate Change on Pacific Island Developing Countries in the 21st Century.' in *Climate Change in the South Pacific: Impacts and Responses in Australia, New Zealand, and Small Island States*, Alexander Gillespie and William C.G. Burns (eds), Kluwer, Dordrecht: 2000, pp. 239-243.

66 William C.G. Burns, 'The Impact of Climate Change on Pacific Island Developing Countries in the 21st Century.' pp. 237-239.

67 Intergovernmental Panel on Climate Change - Working Group I, *Climate Change 2007: The Physical Science Basis*. p. 820.

68 R.N. Jones, A.B. Pittock and P.H. Whetton, 'The Potential Impacts of Climate Change.' p. 17.

69 *National Security and the Threat of Climate Change*. p. 15.

70 Alan Dupont and Graeme Pearman, *Heating up the Planet*. p. 48; CNA Corporation, *National Security and the Threat of Climate Change*, p. 16.

71 Alan Dupont and Graeme Pearman, *Heating up the Planet*, p. 56

72 Alan Dupont and Graeme Pearman, *Heating up the Planet*, pp. 80 - 81.



The costs of preventing or even reducing the effects of sea-level rise are prohibitive and beyond the reach of all but the most wealthy of countries. However, in some cases, the national and global economic impact of not doing anything could be worse. As an example, the Japanese coastal cities of Tokyo, Osaka and Nagoya together account for more than 50% of Japan's industrial production, and between them, about 860 square kilometres of land area containing two million people and \$450 billion of assets are already below mean high-water level.⁷³ A one-metre rise in sea level would expand this area by a factor of 2.7 and increase the people and assets affected to 4.1 million and more than \$900 billion respectively. The estimated cost of adjusting the existing protection measures to cater for a rise of this magnitude is \$80 billion.⁷⁴

In the case of the islands of the South-West Pacific, coastal erosion, flooding, damage to crops and critical ecosystems such as coral reefs and mangrove forests, saltwater intrusion into freshwater sources, and, in conjunction with increased temperature, increased incidence of disease are other potential consequences of sea-level rise. These effects are likely to be further compounded by seasonal storms, high tides and storm surges.⁷⁵ Loss and degradation of land through rising sea levels also has enormous political and economic implications. In particular, those states comprised of low-lying coral atolls, stand to lose significant portions of their land⁷⁶ and their maritime Exclusive Economic Zones.⁷⁷ In Tuvalu, some islands are already flooding at high tide and losing crops to saltwater intrusion,⁷⁸ while in 2005, Papua New Guinea commenced a seven year evacuation of the 1,300 residents of the Kilinailau Islands (also known as the Carteret Group) due to sea level rise.⁷⁹ Although slightly less stark, this problem also applies to the larger high islands such as Fiji and Vanuatu where much of the productive and developed land is located in low-lying coastal areas. In some of the countries, population displacement through the loss of ancestral lands in this way has the potential to inflame ethnic and tribal tensions.⁸⁰ Considerable efforts are being made to develop an adaptive response to these threats, including a proposal to build sea walls around threatened islands to beat rising sea levels. However, the cost is likely to be too prohibitive to pursue on a large scale.⁸¹ Overall, the Republic of Marshall Islands, Tuvalu, and Kiribati stand to suffer the greatest impact, including their potential disappearance as independent states in the worst-case scenario. Other countries such as the Federated States of Micronesia, Nauru, and Tonga may have to undertake major

73 Intergovernmental Panel on Climate Change, *The Regional Impacts of Climate Change*.

74 Intergovernmental Panel on Climate Change, *The Regional Impacts of Climate Change*.

75 John E. Hay and Graham Sem, *Vulnerability and Adaptation*, p. iv.

76 William C.G. Burns, 'The Impact of Climate Change on Pacific Island Developing Countries in the 21st Century.' pp.235-236.

77 Alan Dupont and Graeme Pearman, *Heating up the Planet*. p. 49.

78 Mark Lynas, 'Climate Change: Disappearing Tuvalu.' *The New Courier*, April 2004, available at: <http://portal.unesco.org/en/ev.php-URL_ID=21205&URL_DO=DO_TOPIC&URL_SECTION=201.html>, accessed 18 June 2007.

79 Jane's Country Risk - Daily Report. 'Rising Sea Levels Sparks Papua New Guinea Evacuation.' 25 November 2005, *Jane's Online*, Defence Library Service, available at: <<http://www8.janes.com>>, accessed 13 June 2008.

80 Alan Dupont and Graeme Pearman, *Heating up the Planet*. p. 46.

81 Eric Shibuya, 'Climate Change and Small Island States: Environmental Security as National Security.' in *Security in Oceania in the 21st Century*. Eric Shibuya and Jim Rolfe (eds), Asia-Pacific Center for Security Studies, Honolulu: 2003, p. 147.



internal resettlement of displaced elements of their population.⁸²

Extreme Weather Events

Violent weather events kill around 20,000 people worldwide annually with by far the greatest proportion of those deaths occurring in developing countries.⁸³ Of these, the number of deaths in Oceania due to weather increased by 21% over the last three decades of the 20th century. The intensity of these weather events has been increasing with warming ocean temperatures and this trend is likely to continue with further global warming.⁸⁴ These observations accord with the IPCC projection that, although the frequency of tropical cyclones within the region is likely to reduce during the 21st Century, individual storms can be expected to be more intense on average.⁸⁵ Extreme rainfall and winds associated with tropical cyclones are even more likely to increase in Asia⁸⁶ as the frequency and unpredictability of storms, hurricanes and typhoons becomes greater in Japan and across the eastern coasts of East and South-East Asia. An enhanced El Nino effect could also act to bolster the frequency and severity, and alter the tracks of, Pacific storms.⁸⁷

Of all the impacts of climate change, the increasing intensity of tropical cyclones is likely to have the most immediate short term effect on the Pacific Island states due to a higher incidence of damage to infrastructure, crops and ecosystems, as well as economic impacts and loss of life.⁸⁸ Tropical cyclones can also remove or deposit significant amounts of material from or onto an island in a short period of time, thereby exacerbating (or countering) the effects of coastal erosion through sea level rise. Extreme weather events are also already making their destructive presence felt in the islands with overall economic damage over the last few years running as high as 47% of the Gross National Product of the countries concerned. Any increase in the intensity of these events as a result of climate change will further exacerbate this potentially crippling economic impact.⁸⁹

Regional Security Co-operation

There are both national and non-traditional security concerns relating to climate change that can be addressed through existing bilateral and multilateral security arrangements.

More 'traditional' security concerns arising from climate change include: the potential for conflict over resources; mass migrations due to population displacement; economic

82 Intergovernmental Panel on Climate Change, *The Regional Impacts of Climate Change*.

83 William C.G Burns, 'The Impact of Climate Change on Pacific Island Developing Countries in the 21st Century', p. 245.

84 Alan Dupont and Graeme Pearman, *Heating up the Planet*, pp. 43-44.

85 Intergovernmental Panel on Climate Change - Working Group I, *Climate Change 2007: The Physical Science Basis*. p. 788.

86 Intergovernmental Panel on Climate Change - Working Group I, *Climate Change 2007: The Physical Science Basis*. p. 879.

87 David Seddon, 'Insecure Environment.' p. 8.

88 Eric Shibuya, 'Climate Change and Small Island States.' pp. 139-140.

89 William C.G., Burns, 'The Impact of Climate Change on Pacific Island Developing Countries in the 21st Century', pp. 245-246.



damage as a result of natural disasters and other adverse climatic impacts; enhanced transmission and incidence of vector-borne diseases; and potential state failure and thus enhancement of the conditions for terrorism. However, climate change on its own is unlikely to destabilise significantly the balance of power at either the global or the regional level, or even result in waves of environmental refugees. At a national level, the security-related impacts of climate change should be included as another significant factor to be considered within the already well-established national security policy and planning framework to enable any required priority and capability adjustments to be determined and enacted accordingly.⁹⁰ As a stable regional security environment is fundamental to Australia's national interests, strong and effective bilateral and multilateral engagement must also play an important part in minimising any adverse flow-on effects to Australia from the impacts of climate change on the security and stability of other Asia-Pacific countries.⁹¹

At the regional level, the ASEAN Regional Forum (ARF) is the principal regional organisation for security dialogue in Asia. However, its emphasis on trust-building and dialogue has not produced many tangible outcomes in relation to resolving Asian security issues to date. Nevertheless, recent co-operative approaches to terrorism within the region represent an important step forward in developing a more robust role for the Forum.⁹² Australia should endeavour to build on this progress by continuing to encourage and facilitate further development of the ARF into an institution with the capacity and mandate to respond effectively to security developments within the region.⁹³

The Asia-Pacific Economic Cooperation (APEC) group is also playing an increasingly important role in facilitating a regional response to security issues through the formation of special task groups to co-ordinate agreed actions in areas such as counter-terrorism and health. Important initiatives progressed to date include: the Secure Trade in the APEC Region (STAR); which focuses on measures to ensure the transit security of cargo; international aviation and shipping, and passengers;⁹⁴ and the development and implementation of an APEC action plan for the prevention of, and response to, avian and influenza pandemics.⁹⁵

For security issues relating to the islands of the South-West Pacific, the Pacific Islands Forum (PIF) is the relevant regional organisation. Since the late 1980s, the PIF, or its

⁹⁰ Alan Dupont, and Graeme Pearman, *Heating up the Planet*, pp. 80-84.

⁹¹ Department of Foreign Affairs and Trade, *Advancing the National Interest: Australia's Foreign and Trade Policy White Paper*, Australian Government, 2003, p. 76.

⁹² Philip Winter, 'The East Asian Environmental Situation', pp. 35-39.

⁹³ ASEAN Regional Forum, *ASEAN Regional Forum Annual Security Outlook 2006: Australia*, ASEAN Regional Forum, Jakarta, 2006, p. 2, available at: <<http://www.aseanregionalforum.org/LinkClick.aspx?fileticket=SugCSKT1Pzg=&tabid=291&mid=929>>, accessed 8 June 2007.

⁹⁴ Asia-Pacific Economic Cooperation website, available at:

<http://www.apec.org/apec/apec_groups/som_special_task_groups/counter_terrorism.html>, accessed 18 June 2007.

⁹⁵ Asia-Pacific Economic Cooperation website, available at:

<http://www.apec.org/apec/apec_groups/som_special_task_groups/counter_terrorism.html>, accessed 21 May 2008.



predecessor, the South Pacific Forum, has provided Australia and the sub-region with a useful avenue for working through significant regional issues. Some of the issues worked through the Forum have included the establishment of a South Pacific Nuclear Free Zone, independence for New Caledonia, responding to several coups in Fiji,⁹⁶ the Bougainville peace process⁹⁷ and the recent Regional Assistance Mission to the Solomon Islands (RAMSI).⁹⁸

Australia also maintains a comprehensive web of security arrangements and contacts with the other countries of the region. Chief among these arrangements are: the ANZUS alliance with the United States and New Zealand; the Closer Defence Relations program with New Zealand; the Five Power Defence Arrangements with the United Kingdom, New Zealand, Singapore and Malaysia;⁹⁹ the Australia-Japan Joint Declaration on Security Cooperation;¹⁰⁰ and the Agreement between the Republic of Indonesia and Australia on the Framework for Security Cooperation.¹⁰¹ Other formal agreements within the region include counter-terrorism arrangements with a number of countries including Indonesia, the Philippines, Malaysia, Thailand, Brunei, Cambodia, Fiji, Papua New Guinea and East Timor.¹⁰² More informal arrangements take the form of regular bilateral security dialogues with China, Indonesia, Japan, the Republic of Korea, Vietnam, the Philippines, Thailand, and Malaysia.¹⁰³ This network of regional and bilateral relationships is further supported through an extensive overseas development assistance program aimed at helping regional countries to maintain and enhance their stability and security by reducing poverty and facilitating sustainable development.¹⁰⁴ Aid is also provided in the form of emergency responses to major natural disasters similar to that supplied to Indonesia in the wake of the December 2005 tsunami. Increases in the frequency and severity of climate-related disasters as global warming continues will place increasing emphasis on this form of assistance.¹⁰⁵

96 Jim Rolfe, 'Australia and the Security of the South Pacific.' in *Security in Oceania in the 21st Century*. Eric Shibuya and Jim Rolfe (eds), Asia-Pacific Center for Security Studies, Honolulu: 2003, p. 115.

97 Amraiya Naidu, 'Statement by H.E. Amraiya Naidu, Permanent Representative of Fiji to the United Nations and Chairman of the Pacific Islands Forum Group during the Security Council debate on Bougainville.' United Nations, 21 November 2002, available at: <<http://www.un.int/nauru/pifstatement15.pdf>>, accessed 18 June 2007.

98 Regional Assistance Mission to the Solomon Islands, available at: <<http://www.ramsi.org/node/6>>, accessed 18 June 2007; Pacific Islands Forum Secretariat website, available at: <<http://www.forumsec.org/pages.cfm/security/>, <http://www.forumsec.org/index.cfm>>, accessed 21 June 2007.

99 Department of Foreign Affairs and Trade website, Australian Government, available at: <http://www.dfat.gov.au/arf/bilat_sec_dial.html>, accessed 18 June 2007.

100 'Australia-Japan Joint Declaration on Security Cooperation.' 13 March 2007, available at: <http://www.dfat.gov.au/geo/japan/aus_jap_security_dec.html>, accessed 2 May 2007.

101 'Agreement between the Republic of Indonesia and Australia on the Framework for Security Cooperation.' 2006, available at: <<http://www.dfat.gov.au/geo/indonesia/ind-aus-sec06.html>>, accessed 18 June 2007.

102 Department of Foreign Affairs and Trade, *Transnational Terrorism: The Threat to Australia*. Australian Government, 2004, p. 87; available at: <<http://www.dfat.gov.au/asean>, <http://www.dfat.gov.au>>, accessed 18 June 2007.

103 Department of Foreign Affairs and Trade website, available at: <http://www.dfat.gov.au/arf/bilat_sec_dial.html>, accessed 18 June 2007.

104 Department of Foreign Affairs and Trade, *Advancing the National Interest*. p. 116.

105 Alan Dupont and Graeme Pearman, *Heating up the Planet*. p. 45.



Conclusion

Given its complex, potentially severe, and long-term, if not irreversible, consequences, and the scale of societal reform required to address it, climate change is an environmental security issue that has already attained significant traction in the international arena. Continued global warming will threaten the security of states and populations through changing weather patterns, rising sea levels and extreme weather events. Security concerns most likely to arise as a result of these climate impacts include: potential conflicts over increasingly scarce food, water and energy resources; large scale population movements; significant economic damage that could reduce or destroy the resilience of developing countries; and enhanced transmission and spread of vector-borne diseases. However, it will also produce, as a secondary effect, a range of more traditional security concerns such as an increased potential for state failures and the growth of terrorism.

In the Asia-Pacific region, climate change will compound existing pressures on natural resources and the environment through rapid urbanisation, industrialisation and economic development with this increasing in severity the poorer the country. Asia will become warmer and wetter. Sea levels will rise and the frequency and unpredictability of storms, hurricanes and typhoons will increase across Japan and the east coast of the continent. Expected impacts include heightened flood and drought intensity, reduced crop yields and shifting fish populations, increased risk of epidemics, loss of glacial meltwater as a significant source of drinking water, and inundation of heavily populated coastal areas and cities. Projections for the Oceania region highlight temperature and sea-level increases, and greater intensity in tropical cyclones as key climate-change outcomes. Areas of potential impact arising from these projections include the inundation, flooding and erosion of coastal land, and damage to crops and critical ecosystems such as coral reefs and mangroves.

At the regional level, although the effects of climate change are unlikely to disrupt the balance of power significantly on their own, these effects will need to be factored into established national capability and operational planning processes with emphasis on border protection, counter-terrorism and disaster relief. Australia already maintains a comprehensive web of formal and informal regional and bilateral security arrangements with other Asia-Pacific countries, as well as an extensive development assistance program. Given the importance of regional stability to Australia's national security, maintaining and building on these regional and bilateral relationships will need to remain an essential element of Australia's security response to climate change in the 21st century.



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