Sustainable Development and Climate Change

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Asia/Oceania

In July 2010, Pakistan experienced severe flooding from monsoon rains. Approximately one-fifth of the country was underwater (WFP, 2010), with more than 20 million people directly affected and a death toll of almost 2,000 (Asian Development Bank, 2010). The total economic impact has been estimated at 9 to 11 billion USD (Asian Development Bank, 2010). This type of event is consistent with climate change projections, which see a temporary increase in water availability due to melting of glaciers in the Himalayas, followed by a gradual decline in water availability (Cruz et al., 2007). If these projections are accurate, flooding is the short-term problem but water security will be the long-term problem for South Asia.

Australia also experienced severe flooding in late 2010 and early 2011 in Queensland and Victoria. The Queensland floods killed at least 37 people (Queensland Reconstruction Authority, 2011). Three-quarters of the state was declared a disaster zone (Queensland Reconstruction Authority, 2011) and the cost to the Australian economy is estimated at more than $5 billion (Queensland Government, 2011). Again, more intense rainfall in Australia is consistent with climate change projections, even though total water availability is likely to decline (CSIRO, 2007).

Across Asia and Oceania, a warming world is expected to deliver more floods, more droughts and inundation of coastal land, with likely negative impacts on food production (Cruz et al., 2007; CSIRO, 2007). Coral reefs throughout much of the region are under threat from warming waters, ocean acidification and other anthropogenic impacts. This will have negative impacts on food production, biodiversity and tourism (Hoegh-Guldberg et al., 2007).

According to figures compiled by Australia's Garnaut Review (Garnaut, 2008), the Asia and Oceania region includes half of the top 20 emitters in the world (when the EU is taken as a single emitter). China is the world's largest emitter in absolute terms, whereas Australia is one of the world's largest emitters in per capita terms. India, Indonesia, Malaysia, the Republic of Korea, Myanmar, Iran, Thailand and Saudi Arabia are also among the top 20 emitters in absolute terms. However, many of these countries have relatively low per capita emissions and are in the top 20 because of their large populations (Garnaut, 2008). Continuing population growth in Asia will put increased pressure on greenhouse gas emissions in the future.

While global greenhouse gas emissions from fossil fuel combustion declined by 1.3% in 2009 due to the effects of the Global Financial Crisis, these emissions continued to grow rapidly in China (8%), India (6.2%) and South Korea (1.4%) (Global Carbon Project, 2010). Some of the

growth in emissions in Asian nations is due to increases in international trade of goods and services produced in developing countries but consumed in developed countries (Global Carbon Project, 2010). In other words, developed countries are outsourcing a proportion of their emissions to developing countries in Asia and elsewhere.

Countries in Asia and Oceania have established voluntary emission reduction targets for 2020 that are incorporated into the 2010 Cancun Agreements under the United Nations Framework Convention on Climate Change. Among industrialised nations listed in Annex I of the Convention, Australia has offered an emission reduction of 5-25% between 2000 and 2020, Japan has communicated a conditional 25% reduction between 1990 and 2020, and New Zealand has offered a conditional 10-20% reduction between 1990 and 2020 (Ecofys, 2011). Among countries not listed in Annex I of the Convention, India will endeavour to reduce the emissions intensity of its GDP by 20-25 per cent between 2005 and 2020, Indonesia plans to reduce its emissions by 26% by 2020, and South Korea will seek to reduce its emissions by 30% from business as usual levels (Ecofys, 2011).

China will endeavour to lower its emissions per unit of GDP by 40-45 per cent by 2020 relative to 2005. It also intends to increase the share of non-fossil fuels in primary energy consumption to 15 per cent by 2020 and to increase forest coverage substantially (Ecofys, 2011). Steps towards these commitments are embedded in China's 12th Five-year Plan, which aims to reduce energy intensity by 16% by 2015, reduce CO_2 intensity by 17% by 2015 and increase non-fossil fuels to 11.4% of primary energy by 2015 (Patel, 2011).

For China, India, Japan and South Korea, nuclear power has been a key element in the response to climate change. Once built, nuclear power stations have very low greenhouse gas emissions so they offer a pathway to a low-carbon economy. China has 13 nuclear power reactors and more than 20 under construction. Currently, nuclear power provides only 1% of China's electricity but this is set to increase to 5% by 2020 (Biello, 2011). China's 5-year Plan for 2011-2015 includes an increase in nuclear power capacity from 10GW to 50GW (Patel, 2011). India has 20 nuclear reactors and plans to increase the contribution of nuclear power from 4% to 25% of electricity generation by 2050 (World Nuclear Association, 2011a). Japan's 54 nuclear reactors provide 30% of its electricity supply, with plans to increase this to 50% by 2030 (World Nuclear Association, 2011b). Indonesia is considering a nuclear power program (McGeown, 2011).

On 11 March 2011, Japan experienced a massive earthquake and tsunami. This initiated a partial meltdown and nuclear crisis at the Fukushima nuclear power station (Schneider, Froggatt & Thomas, 2011). The future repercussions of this event could be significant for the nuclear power industry and climate change response in Asia. China, India, Japan and South Korea are relying, at least partially, on expansions in nuclear power to deliver reductions in greenhouse gas emissions. If these countries decide to slow or stop this expansion, they will need to find alternative emission reduction options. So far, most Asian nations look like continuing their nuclear power expansion plans despite the events in Japan. However, Japan is looking to renewable energy technologies as part of its rebuilding efforts (Birmingham, 2011).

Many countries in Asia and Oceania are increasing their investments in renewable energy. China has become the leading manufacturer of solar panels and wind turbines globally and is positioning itself to dominate renewable energy manufacturing in the

future (Bradsher, 2010). China's solar PV manufacturing capacity was over 8GW in 2010, accounting for 53% of total global manufacturing capacity. Most of the solar panels are exported, however China anticipates increasing its own installed solar capacity to 5GW by 2015. Wind power capacity is expected to reach 130GW by 2015 (Deblock Consulting, 2011).

The Republic of Korea has embraced the concept of green growth, seeing economic growth as compatible with reducing greenhouse gas emissions. The Basic Act on Low Carbon Green Growth commits Korea to green growth and will see 2% of GDP invested in green infrastructure annually (UN ESCAP, 2010).

India has established the National Solar Mission, aiming to bring online 1GW of new solar capacity by 2013, an additional 3GW by 2017 and 20GW by 2022 (Ministry of New and Renewable Energy, 2009). India anticipates achieving grid parity by 2022 and parity with coal fired power by 2030 (Ministry of New and Renewable Energy, 2009). Like China, India is positioning itself to be a global leader in technologies for responding to climate change.

One of the most important climate-related initiatives for the Asian region is the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD+). This initiative creates a financial value for the carbon stored in forests and rewards developing countries for reducing emissions from deforestation and forest degradation and managing forest sustainability to enhance carbon stocks. REDD+ has the potential to deliver North-South monetary flows of up to $30 billion per year and several Asian nations, such as Indonesia, Vietnam, the Philippines and Papua New Guinea, are potential beneficiaries (UN REDD Programme, 2011). Financing for REDD+ initiatives remains a key issue for international climate change negotiations.

Given the major current and future contribution of Asian nations to global greenhouse gas emissions, it will be the development pathways in Asia over the coming decades that will determine whether or not the world can respond successfully to climate change. If China, India and other Asian nations continue their tentative steps down the path to a clean energy economy they have the potential to establish new green growth pathways and to lead the global green economy.

Australia

In late 2010 and early 2011, Australia experienced a series of natural disasters that gave a taste of the future under a changing climate. The state of Queensland suffered from devastating flooding, killing at least 37 people (Queensland Reconstruction Authority, 2011). Three-quarters of the state was declared a disaster zone (Queensland Reconstruction Authority, 2011) and the cost to the Australian economy is estimated at more than $5 billion (Queensland Government, 2011). Victoria also experienced major flooding. While most of Australia is expected to receive less total rainfall as a result of climate change, climate scientists also project that rainfall events will be more intense and bring more extreme rainfall when they do come (CSIRO, 2007), making flood events like those experienced in Australia in 2010-11 more likely in the future.

On 3 February 2011, in the wake of the floods, Tropical Cyclone Yasi reached the Queensland mainland as a Category 5 storm. The cyclone wreaked damage on coastal towns, with restoration and reconstruction costs estimated at more than $800 million (Queensland Reconstruction Authority, 2011). Thirteen per cent of the Great Barrier Reef was affected and may take up to 10 years to recover (GBRMPA, 2011; ABC

News, 2011). Tropical cyclones are likely to increase in intensity as the world warms, although the total number of cyclones may decline (IPCC, 2007; CSIRO, 2007).

Based on climate projections (e.g. CSIRO, 2007; IPCC, 2007), these natural disasters give a preview of the kind of future Australians can expect as global warming continues. Already renowned as a land 'of drought and flooding rains',[1] Australia is likely to experience more drought, more floods, more bushfires and more intense tropical cyclones if global warming continues unabated (CSIRO, 2007). As the driest inhabited continent, with many ecosystems already under stress (Beeton et al., 2006), Australia is uniquely vulnerable to climate change (Department of Climate Change, 2010). Priceless assets like the Great Barrier Reef, under threat from tropical cyclones, warming waters, ocean acidification and urban and agricultural runoff, may be lost (Hoegh-Guldberg et al., 2007). Irrigated food production within the highly stressed Murray-Darling Basin will decline as water resources become scarce (DCCEE, 2011b). Sea level rise and the effects of tropical cyclones will threaten coastal communities, where most Australians live (Department of Climate Change, 2010).

Despite these bleak images of the future, action to reduce greenhouse gas emissions in Australia is not sufficient to prevent continued growth in emissions. The global recession of 2008-09 prompted a drop in Australia's emissions and there emissions have been relatively steady since then (DCCEE, 2011a). However, emissions are projected to increase by 24% between 2000 and 2020 without further action (DCCEE, 2010). Australia remains one of the highest emitters of greenhouse gases per person in the world (Garnaut, 2008).

How to respond to these challenges has become a political and ideological battleground in Australia. In 2011, the Australian Labor Party governs with support from the Greens and several Independents. It is working with these partners to implement an emissions trading scheme, starting with a fixed carbon price (akin to a carbon tax). The target for commencement of the scheme is 1 July 2012.

The Coalition of the Liberal Party and National Party (the other major political parties) supports a bipartisan target to reduce Australia's emissions by 5% between 2000 and 2020 but has opposed carbon pricing mechanisms due to concerns about cost of living and employment impacts (The Coalition, 2009). Its preferred policy is a Direct Action Plan on Climate Change and the Environment that would provide direct financial support for emission reductions by industry and improvements in soil carbon (The Coalition, 2009).

Public concern about climate change in Australia peaked in 2007 and 2008 and has since declined (Hanson, 2010; Pugliese & Lyons, 2010). Following heated public debate about the science of climate change and how best to respond, fewer people believe that humans are responsible for climate change (Pugliese & Lyons, 2010). While a strong majority express concern about climate change, a minority express willingness to bear costs to respond to climate change (Newspoll, 2011). Reflecting the political divisions, belief that climate change is caused by human activity and support for proposed carbon pricing is significantly higher among Labour supporters than Coalition supporters (Newspoll, 2011). An effective future response to climate change in Australia will need to allay community concerns about cost of living pressures and find ways to motivate people with different political perspectives to support climate action.

The public debate over climate change and the decline in public belief in the human contribution to climate change poses challenges to science and its role in policy

formation. In the arena of power and politics, established scientific practices such as peer-review and consensus building are being called into question and scientists become just another voice in the clamour. The authority of science has broken down and new models for the role of science in public policy are emerging (Hulme, 2009; Jasanoff, 2010). Scientists are increasingly drawn into public debates and need to learn how to engage with media, including new social media technologies. The opening up of the scientific method for public scrutiny is an important trend, prompted in part by the challenge of climate change.

Amidst the heated public debate, some institutions with strong future potential have been established in response to climate change. In response to the scientific challenges discussed above, the Australian Government established a Climate Commission to inform Australia's approach to addressing climate change and help build the consensus required to move to a competitive, low pollution Australian economy. The Climate Commission is an expert body, comprised of scientists, business leaders and science communicators, that seeks to explain climate science to the community and engage in the public debate. It is an important attempt to build the institutional capacity for a new kind of open, community-engaged science.

Australia has legislated a National Renewable Energy Target to generate 20% of electricity from renewable sources by 2020. This is driving investment in renewable energy, particularly in wind power. However, investments are far less than in China, India, Europe and the United States. Australia has abundant renewable energy resources, including one of the best solar insolation resources in the world, strong wind power potential along the southern coastline, geothermal resources in central Australia and wave and tidal resources along its extensive coastline (Geoscience Australia, 2010). With foresight, Australia could develop into a renewable energy superpower but is currently at risk of being left behind as other countries invest far more in these technologies.

One area where Australia has shown leadership is in accounting for greenhouse gas emissions from land use, land use change and forestry (DCCEE, 2011c). This leadership is set to continue in 2011 with the legislation of the Australian Government's Carbon Farming Initiative, which will give farmers, forest growers and landholders access to domestic voluntary and international carbon markets. The land sector contributes 23 per cent of Australia's emissions (DCCEE, 2011a), so finding abatement opportunities in this sector is critical. A new version of Australia's National Carbon Audit Toolbox is also due for release in 2011 (DCCEE, 2011c), which enables land managers to track greenhouse gas emissions to and removals to and from the atmosphere.

One of the reasons for the heated debate over climate change response is that it challenges core values and worldviews. Climate change asks us whether continued economic growth based on growth in material consumption is possible. It asks us whether a consumer culture, built on unbridled gratification, can be sustained. It asks us to exercise restraint. For conservatives and economic rationalists, these ideas are anathema (Lakoff, Dean, & Hazen, 2004). For now, few politicians or thought leaders are willing to raise these fundamental questions. They are the frontier of the debate in Australia and it is inevitable that Australians will need to begin to address these questions over the coming decades.

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Note

1 From Dorothea Mackellar's poem, *My Country.*

References

ABC News. (2011). "Yasi does 10yrs damage to Barrier Reef." *ABC News*, 5th February, [online] Retrieved May 19, 2011 from http://www.abc.net.au/news/stories/2011/02/05/3130919.htm.

Asian Development Bank. (2010). *Pakistan Floods 2010: Preliminary Damage and Needs Assessment, Islamabad, Pakistan, Asian Development Bank and the World Bank*. [online] Retrieved May 19, 2011 from http://siteresources.worldbank.org/PAKISTANEXTN/Resources/293051-1264873659180/6750579-1291656195263/PakistanFloodsDNA_December2010.pdf (Accessed 19 May 2010).

Beeton, Rjs, Kristal I. Buckley, Gary J. Jones, Denise Morgan et al. (2006). "Australia State of the Environment 2006, Canberra, independent report to the Australian Government Minister for the Environment and Heritage." *Department of the Environment and Heritage*. [online] Retrieved May 19, 2011 from http://www.environment.gov.au/soe/2006/publications/report/index.html.

Biello, David. (2011). "China forges ahead with nuclear energy." *Nature*, Nature Publishing Group, [online] Retrieved May 19, 2011 from http://www.nature.com/news/2011/110329/full/news.2011.194.html?s=news_rss (Accessed 19 May 2011).

Birmingham, Lucy. (2011). "Why Japan's shift away from nuclear is good for business." *Time*, *18 May*, [online]. Retrieved May 19, 2011 from http://www.time.com/time/world/article/0,8599,2072193,00.html

Bradsher, Keith. (2010). "China leading global race to make clean energy." *The New York Times*, 30th January, [online]. Retrieved May 19, 2011 from http://www.nytimes.com/2010/01/31/business/energy-environment/31renew.html

Cruz, R.V., H. Harasawa, M. Lal, S. Wu et al. (2007). "Asia." In Parry, M. L., O. F. Canziani, J. P. Palutikof, P. J. van der Linden, & C. E. Hanson (Eds.), *Climate Change 2007: Impacts, Adaptation and Vulnerability.* Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge, UK, Cambridge University Press, pp.469-506.

CSIRO. (2007). "Climate change in Australia: Technical report 2007." *CSIRO*, [online]. Retrieved May 19, 2011 from http://www.climatechangeinaustralia.gov.au/technical_report.php

DCCEE. (2011a). "Australian national greenhouse gas accounts: National greenhouse gas inventory accounting for the Kyoto target, December quarter 2010, Canberra." *Department of Climate Change and Energy Efficiency*, [online]. Retrieved May 20, 2011 from http://www.climatechange.gov.au/publications/greenhouse-acctg/national-greenhouse-gas-inventory-2009.aspx

DCCEE. (2010) "Australia's emission projections 2010, Canberra." *Department of Climate Change and Energy Efficiency,* [online]. Retrieved May 20, 2011 from http://www.climatechange.gov.au/publications/projections/australias-emissions-projections.aspx

DCCEE. (2011b). "Impacts of climate change: Murray darling basin." *Department of Climate Change and Energy Efficiency* website, [online]. Retrieved May 20, 2011 from http://www.climatechange.gov.au/climate-change/impacts/national-impacts/murray-darling-basin.aspx

DCCEE. (2011c). "National carbon accounting system." *Department of Climate Change and Energy Efficiency Website*, [online]. Retrieved May 20, 2011 from http://www.climatechange.gov.au/government/initiatives/national-carbon-accounting.aspx

Deblock, Consulting. (2011). *China's Five-year Plan and Renewable Energy - a Detailed Explanation*, [online]. Retrieved May 19, 2011 from http://deblock-consulting.com/blog/china-news/chinas-five-year-plan-renewable-energy-a-detailed-explanation/

Department of Climate Change. (2010). *Adapting to Climate Change in Australia: An Australian Government Position Paper, Canberra*, [online]. Retrieved May 20, 2011 from http://www.climatechange.gov.au/publications/adaptation/position-paper.aspx

Ecofys. (2011). *Climate Action Tracker*, [online]. Retrieved May 19, 2011 from http://www.climateactiontracker.org/

Garnaut, Ross. (2008). *The Garnaut Climate Change Review*. Port Melbourne, Cambridge University Press.

GBRMPA. (2011). "Cyclone Yasi impacts on the Great Barrier Reef assessed." *Great Barrier Reef Marine Park Authority*, [online]. Retrieved May 19, 2011 from http://www.gbrmpa.gov.au/corp_site/info_services/media/media_archive/2011/2011_03_07

Geoscience Australia (2010). "Australian energy resource assessment, Canberra." *Australian Government*, [online]. Retrieved May 20, 2011 from http://www.abare.gov.au/publications_html/energy/energy_10/ga_aera.html

Global Carbon Project. (2010). *Carbon Budget 2009*, [online]. Retrieved May 19, 2011 from http://www.globalcarbonproject.org/carbonbudget/index.htm

Hanson, F. (2010). "The Lowy Institute Poll 2010: Australia and the world, public opinion and foreign policy, Sydney." *Lowy Institute for International Policy*, [online]. Retrieved May 19, 2011 from http://www.lowyinstitute.org/Publication.asp?pid=1305

Hoegh-Guldberg, O, P. J. Mumby, A. J. Hooten, R. S. Steneck et al. (2007). "Coral reefs under rapid climate change and ocean acidification." *Science*, *318*(5857),

pp.1737-42, [online]. Retrieved May 19, 2011 from http://www.ncbi.nlm.nih.gov/pubmed/18079392

Hulme, Mike. (2009). *Why We Disagree About Climate Change: Understanding Controversy, Inaction and Opportunity*. Cambridge, Cambridge University Press.

IPCC. (2007). Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Pachauri, R. K. and Reisinger, A., with Core Writing Team (eds.), csa.com, Geneva, Switzerland: IPCC.

Jasanoff, S. (2010). "A New Climate for Society." *Theory, Culture and Society,* 27(2-3), pp.233-253, [online]. Retrieved May 19, 2011 from http://tcs.sagepub.com/cgi/doi/10.1177/0263276409361497

Lakoff, George, Howard Dean, & Don Hazen. (2004). *Don't Think of an Elephant!: Know Your Values and Frame the Debate--The Essential Guide for Progressives.* Chelsea Green.

McGeown, Kate. (2011). "Indonesia nuclear reactor plans 'to go-ahead'." *BBC News Asia-Pacific*, [online]. Retrieved May 19, 2011 from http://www.bbc.co.uk/news/world-asia-pacific-12742021

Ministry of New and Renewable Energy. (2009). "Jawaharlal Nehru national solar mission: Towards building solar India." *Government of India*, [online]. Retrieved May 19, 2011 from http://mnre.gov.in/pdf/mission-document-JNNSM.pdf

Newspoll. (2011). "Newspoll on climate change, 4 May 2011." *Newspoll*, [online]. Retrieved May 20, 2011 from http://www.newspoll.com.au

Patel, Sonal. (2011). "China's five-year plan is heavy on non-fossil generation." *Power*, (May), [online]. http://www.powermag.com/nuclear/Chinas-Five-Year-Plan-Is-Heavy-on-Non-Fossil-Generation_3611.html

Pugliese, Anita, & Linda Lyons. (2010). "Australians' Views Shift on Climate Change." *Gallup Poll*, [online]. Retrieved May 20, 2011 from http://www.gallup.com/poll/141782/Australians-Views-Shift-Climate-Change.aspx

Queensland Government. (2011). "State budget 2010 – 11: Mid year fiscal and economic review, review literature and arts of the Americas." *Queensland Treasury,* [online]. Retrieved May 19, 2011 from http://www.treasury.qld.gov.au/office/knowledge/docs/mid-year-review/index.shtml

Queensland Reconstruction Authority. (2011). "Operation queenslander: The State Community, economic and environmental recovery and reconstruction plan 2011-2013, [online]." Retrieved May 19, 2011 from http://www.qldreconstruction.org.au/state-plan

Schneider, Mycle, Antony Froggatt, & Steve Thomas. (2011). "The world nuclear industry status report 2010-2011: Nuclear power in a post-fukushima world." *Worldwatch Institute*, [online]. Retrieved May 19, 2011 from http://www.worldwatch.org/nuclear-power-after-fukushima

The Coalition (2009). The Coalition's Direct Action Plan: Environment & Climate Change, [online]. Retrieved May 20, 2011 from http://www.liberal.org.au/~/media/Files/Policies and Media/Environment/The Coalitions Direct Action Plan

Policy.ashx
UN ESCAP. (2010). Korea passes legislative framework for Low Carbon Green Growth, [online]. Retrieved May 19, 2011 from http://www.greengrowth.org/gg-initiative.asp
UN REDD Programme. (2011). The United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries, [online]. Retrieved May 19, 2011 from http://www.un-redd.org/
WFP. (2010). "Pakistan flood impact assessment." *United Nations World Food Programme,* [online]. Retrieved May 19, 2011 from http://www.wfp.org/content/pakistan-flood-impact-assessment-september-2010
World Nuclear Association. (2011a). *Nuclear Power in India,* [online]. Retrieved May 19, 2011 from http://www.world-nuclear.org/info/inf53.html
World Nuclear Association. (2011b). *Nuclear Power in Japan,* [online]. Retrieved May 19, 2011 from http://www.world-nuclear.org/info/inf79.html