

# **A Just Transition to Sustainability in a Climate Change Hot Spot: The Hunter Valley, Australia**

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# Signed Declaration

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# Abstract

This thesis uses a transdisciplinary, sustainability-science approach to investigate the potential for the Hunter Valley region of New South Wales, Australia to make a transition to sustainability. The Hunter Valley, one of Australia's historic food, wine and grain breadbaskets, is now home to over 50 open cut and underground black coal mines and is one of the world's major coalmining and exporting regions. It is Australia's largest black coal electricity generating region where six coal-fired power stations generate 40% of Australia's electricity supply. The carbon intensity of the Hunter Valley's economy makes the region Australia's largest direct and indirect contributor to global carbon dioxide emissions. The region is a climate change hot spot that embodies the challenges and opportunities confronting Australia if it is to move towards a clean, renewable energy future and ecologically and socially-sustainable economy. The study examines the Hunter Valley as a complex adaptive socio-ecological system nested in an extended panarchy (Gunderson and Holling, 2002) that includes global energy systems and the ecosphere. The research examines the linked ecological and social health impacts of different scenarios for the Hunter Valley, comparing its current status – given the name *Carbon Valley* (Ray, 2005a) – with an alternative socio-ecological regime described by local residents as a *Future Beyond Coal* (CAN, 2006). This *Future Beyond Coal* is a regional manifestation of what Heinberg (2004) calls, at a global scale, a *Post-carbon Society*. Transdisciplinary sustainability-science is used to examine complex processes in which Hunter Valley residents are dealing with linked ecosystem-human health distress, while developing capacity for anticipating and forging change towards sustainability. They are also boosting the resilience of desirable states while challenging the perverse resilience of coal dependency. The thesis examines the potential for a 'Just Transition' to sustainability, a social and economic restructuring process which aspires to move the region's socio-ecological relationships rapidly towards sustainability through protecting the wellbeing of vulnerable workers, communities and ecosystems. It investigates hegemonic relationships within coal communities, and the role popular education and social learning are playing in building a social movement for sustainability, a movement that links local, regional and global attractors and disturbances in order to change the basin of attraction from the current non-sustainable coal-dependent society to one that is ecologically sustainable and socially just.

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# List of shortened forms

ACF	Australian Conservation Foundation
ACTU	Australian Council of Trade Unions
AIGN	Australian Industry Greenhouse Network
ALP	Australian Labor Party
AMWU	Australian Manufacturing Workers Union
ASEN	Australian Students Environment Network
AWU	Australian Workers Union
BAU	business-as-usual
BLF	Builders Labourers Federation
CAN	Climate Action Newcastle
CANA	Climate Action Network Australia
CAP	Catchment Action Plan
CARMA	Carbon Monitoring for Action
CAS	Complex adaptive system
CCAG	Caroona Coal Action Group
CCC	Community Consultative Committees
CCS	Carbon capture and storage
CDM	Clean Development Mechanism
CEI	Clean Energy Initiative
CFMEU	Construction Forestry Mining and Energy Union
CFMEU M&E	Construction Forestry Mining and Energy Union Mining and Energy Division
CLC	Canadian Labour Congress
CMA	Catchment Management Authority
CofFEE	Centre of Full Employment and Equity, University of Newcastle
CoI	Commission of Inquiry
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> e	carbon dioxide equivalency
CPRS	Carbon Pollution Reduction Scheme
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DECC	NSW Department of Environment and Climate Change
DLWC	NSW Department of Land and Water Conservation
DPI	NSW Department of Primary Industries
DSRD	NSW Department of State and Regional Development
DUAP	NSW Department of Urban Affairs and Planning
EFI	Eco-footprint Index
EITE	Energy Intensive Trade Exposed (industries)
ESD	ecologically sustainable development
EWG	Energy Working Group
FoE	Friends of the Earth
GDP	Gross Domestic Product
gha	global hectares
GHG	greenhouse gas
GPI	Genuine Progress Indicator

Gt	Billion tonnes
GW	gigawatt
GWh	gigawatt hours
HEHI	holistic ecosystem health indicator
HEL	Hunter Environment Lobby
HIV/AIDS	human immunodeficiency virus/acquired immune deficiency syndrome
HROC	Hunter Regional Organisation of Councils
ICEM	International Federation of Chemical Energy Mine and General Workers' Unions
IEA	International Energy Agency
IFE	Institute for Energy
ILO	International Labour Organization
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
ITUC	International Trade Union Confederation
IUCN	International Union for the Conservation of Nature
LGSA	Local Government and Shires Association
MAP	Movement Action Plan
MLC	Member of the Legislative Council
MP	Member of Parliament
MPI	Mineral Policy Institute
Million tonnes	Mt
NEMMCO	National Electricity Market Management Company
NCC	Newcastle City Council
NFFE	National Framework for Energy Efficiency
NGO	non-government organisation
NSESD	(Australia's) National Strategy for Ecologically Sustainable Development
NSW	New South Wales
OCGT	open-cycle gas turbines
OECD	Organisation for Economic Cooperation and Development
PAR	Participatory action research
ppmv	parts per million of CO <sub>2</sub> e by volume
PV	photo-voltaic
REN 21	Renewable Energy Network for the 21st Century
RET	Renewable Energy Target
SCCC	Southern Cross Climate Coalition
SD	sustainable development
SES	socio-ecological system
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
WCED	World Commission for Environment and Development
WHO	World Health Organization
WWF	World Wildlife Fund

# Glossary

Clean energy	‘Jobs, businesses and investments that produce, transmit and store clean, renewable power from solar, wind, low-impact hydro, hydrogen fuel cells, marine and tidal, geothermal and small-scale biopower energy sources’, the definition used by the Washington DC-based Pew Center in the USA (Pew Charitable Trusts, 2009: 12).
Ecosystem	A complete community of living organisms and the non-living materials of their surroundings. Thus, its components include plants, animals, and microorganisms; soil, rocks, and minerals; as well as surrounding water sources and the local atmosphere (Science Clarified, 2006).
Ecological footprint	A measure of human demand on the Earth's ecosystems. It compares human demand with planet Earth's ecological capacity to regenerate. It represents the amount of biologically productive land and sea area needed to regenerate the resources a human population consumes and to absorb and render harmless the corresponding waste. Using this assessment, it is possible to estimate how much of the Earth (or how many planet Earths) it would take to support humanity if everybody lived a given lifestyle.
Ecology	A multidisciplinary science that studies the interactions between living organisms and their biotic and abiotic environments. The environment of an organism includes physical properties that make up the sum of local abiotic factors such as climate and geology, and biotic ecosystem which includes other organisms (including humans) that share its habitat.
Green jobs	Secure, well-paid, quality jobs which are clean, healthy and stress-free and which have a direct, positive impact on the environment (Canadian Labour Congress, 2000: 1).
Long-wall	A form of underground coalmining where a long wall (typically about 250–400 m long) of coal is mined in a single slice (typically 1–2 m thick). The long-wall panel (the block of coal that is being mined) is typically 3–4 km long and 250–400 m wide.
Open cut	A mining technology that involves removing the topsoil and top layers of rock to reveal coal seams near the surface, and then removing the coal while creating a large open pit.
Social movements	Collective actions in which the populace is alerted, educated, and mobilised, sometimes over years and decades, to challenge the powerholders and the whole society to redress social problems or grievances and restore critical social values (Moyer <i>et al.</i> , 2001: 2).

# Preface and acknowledgements

After six years it is a great relief to finish the writing of this thesis, even if the campaigns it describes shall continue for the foreseeable future. One of the great challenges of this thesis has been finding the point to draw a line under it as the climate change, ecosystem health and social justice issues I write about are so dynamic, and new directions are constantly unfolding. This has particularly been the case in 2008–09 in the lead up to the international climate change agreements being negotiated at the United Nations Climate Change Conference in Copenhagen; as the Australian Government made some major policy announcements; and the Obama Administration set new directions in the US after the long years of the Bush Administration. Political change is occurring as a global financial crisis unfolds, and the warnings of climate scientists tell us that potentially catastrophic climate chaos looms ever more likely.

The convergence of so many issues and changes to policy possibilities is both a wake-up call that humanity needs to urgently act together and a cause for excitement about an historic moment and potential for real change to happen.

My feeling of optimism is tinged with fear that an historic opportunity will be missed. I hope this thesis makes a small contribution to moving things forward towards genuine sustainability, at least in the place where I live, and have come to love – the Hunter Valley of Australia.

I learnt, as a student, some solid foundations for environmental and social justice activism: passion, ethics, care and science. Though environmental activism I learnt about grassroots organising and campaigning, about educating the public and confronting corporate power and government expediency. The *Radical Ecology Conference*, held in Melbourne in Easter 1975, was where I first saw the breadth of the Australian environment movement, and the possibility that bold visions matched with grassroots action for an egalitarian society can achieve a just and sustainable future.

Many years and many campaigns later I moved, with my partner Deborah Hartman and (then) baby Jack, to the small gold and copper mining town of Tennant Creek in the heart of the desert country of Australia's Northern Territory. It was perhaps here, more than any other place, that I was directly confronted by the linked human and ecological dimensions of distress of the land and the health of people. My first job in Tennant Creek was helping (as a volunteer with Jane Simpson and John Havnen) to document the appalling living conditions of the Indigenous people living in the camps in and around Tennant Creek. This was the beginning of many years learning from the Warumungu, Alyawarr, Wambaya, Warlmanpa and Warlpiri people of the Tennant Creek and Barkly region. Sadly, many of my teachers and friends have 'finished up' at far too early an age. However, the Dawsons, Franks, Grants, Stokes, Nelsons, Corbetts, Murphys and Fosters – to name just a few – have been good and dear friends to my family and have taught us

about the power of the link between people and country. We still cherish these connections.

Some years later, as convenor of the Arid Lands Environment Centre in Alice Springs, I was again involved in linked ecological-human health and social justice issues when central Australia was designated as the proposed site for disposal of Australia's stockpile of radioactive waste. Once again, as at Maralinga and Jabiluka, Indigenous people were designated to carry the burden of society's most hazardous industry and its waste. This fight continues today, with four sites close to Indigenous communities in the Northern Territory – including at Muckaty, north of Tennant Creek – being designated radioactive waste dumps. Strong community resistance continues.

When my family moved to Newcastle from Alice Springs 10 years ago, I again found myself working on mining issues with local people fighting to protect the beautiful Hunter Valley from being destroyed by vast open-cut coalmines. People like Wendy Bowman, Gail Collins, Julia Imrie, Christine, Phelps Bev Smiles, Mavis and Tony Tersteeg, Peter Flynn and Tim Duddy were just a few among the thousands of families affected by coalmines and coal-fired power stations who staunchly resisted the impact of the Hunter Valley's carbon economy on their lives and wellbeing – and from whom I have learnt.

The restoration of ecological and social health is through the courage and generosity of many people who invariably act for no vested interest other than a wish to live in a healthy place and a healthy community, providing local expertise, advice, encouragement, contacts, hospitality, food and shelter, and love to the world.

I never expected to be a PhD candidate, and perhaps there are some who will say, 'He never should have been one!' However, I must thank Professor Glenn Albrecht, then of the University of Newcastle (now Murdoch University) for encouraging me to 'have a go', and for believing that I could do it. Glenn has been a great friend and mentor. He has also recognised that students, even mature-aged students with a family such as myself – and especially ones who are not on a scholarship – need an income, and he has assisted me with paid work as a lecturer, tutor, and course developer in courses related to my thesis. Glenn's academic support as a supervisor has also been extraordinary. I have been very fortunate in having such an inspirational and supportive supervisor, a true 'critical friend'. His rigorous critique of my work and advice on readings and theories has been invaluable and allowed me to structure my argument around key propositions in what I hope is a useful and interesting transdisciplinary study.

I must thank Professor Phil O'Neill (now of University of Western Sydney) who helped get me started on the thesis, and the other lecturers, staff, and fellow students and researchers at the School of Environment Life Sciences at University of Newcastle, who also contributed a supportive and academically challenging environment.

I have been inspired by the new generation of activists becoming involved in environment and social justice issues, in Rising Tide, Friends of the Earth, the Australian

Students Environment Network (ASEN), Newcastle University Students' Association (NUSA) and elsewhere. I'm encouraged by the many excellent workplace and community activists and officials within various trade unions, including both the Construction Forestry Mining Energy Union (the CFMEU) in the Hunter Valley and the Australian Manufacturing Workers Union (the AMWU) who helped me grapple with the issues involved in making a transition to a Green economy while protecting the livelihoods of vulnerable workers and communities; that is, a Just Transition.

Thanks to Peter Lewis, resident cartoonist at the *Newcastle Herald*, for generously providing cartoons that so well depict Hunter Valley life and issues. Thanks also to Jill Albrecht, Liam Phelan, Mark Maclean and Christine Bruderlin who have provided great skill with comments as critical friends, proofreaders and designers, and also encouragement and friendship.

Most important has been the love and support of my fabulous family – wife Deborah and sons Jack and Vincent – who have been so encouraging and generous about the disruptions to time together as I have beavered away on this project over six years. As an impoverished student, the belt-tightening of relying on casual and part-time work has been tough on all of us at times, but has encouraged us to cook a lot at home and get an excellent vegie garden happening!

Writing the thesis has been a luxury that I have been able to enjoy and greatly appreciate. I hope it is of some value to the millions of people around the world who risk their wellbeing – for some their very lives – to protect the planet and create a safe, secure and environmentally friendly livelihood, and who hopefully still can find some time to contemplate the dignity of humans, the beauty of nature and all the wonderful living things on it.

# Introduction

This study is about how the Hunter Valley in New South Wales, a region that has been described as a food bowl and breadbasket<sup>1</sup> of Australia “with an international reputation for fine wine and finer cuisine” (Mason, 2007) can avoid becoming a basket case<sup>2</sup> – a place suffering from linked and irreparable social and ecological distress syndromes.

The study is a transdisciplinary examination of the Hunter Valley from a complex adaptive systems perspective. The research examines the dialectics and potential for transition to sustainability and the role of opposing social and ecological forces to drive alternative scenarios. One potential scenario is ongoing coal dependency that is pushing the region’s linked social and ecological systems towards ecosystem and social collapse and chaos in the quest for short-term economic gain. The alternative scenario investigated is a just transition to sustainability that aims to restore ecological and social health, and justice *to* and *in* the environment (Low & Gleeson, 1997) as the over-riding principles guiding the region’s future development trajectory.

The research investigates how a region that is the largest exporter of coal to the global economy can develop a “moral economy” that is based on the “right relationships” between humans, and between humans and nature, guided by principles of “goodness, fairness and justice” (Brown & Garver, 2009: 3). In a moral economy relationships between humans and nature in both particular localities and across the planet as a whole acknowledge that humans live within the planet’s ecological limits and that practices in one place affect the health of people and places in others. The purpose of a moral economy is to protect the “integrity, resilience, and beauty of the commonwealth of life for future generations” (Brown & Garver, 2009: 21).

Brown and Garver (2009) propose that a moral economy would be based on awareness of “the beauty and majesty of the cosmos and recognition of humanity’s appropriate place in it” (2009: 21). It would be an economy for protecting “the whole earth” that is informed by history but tailored to the future. The foundations for achieving a moral economy are democratic, transparent, accountable and effective local and global governance institutions and regimes, in which individual and collective political commitments to transformation and action to achieve sustainability are ignited by social movements that change hearts, minds, policy and practices (Brown and Garver, 2009).

All humans aspire to live in a healthy, safe and just world, but our potential for doing so is at risk because the health of the biosphere that we depend on is under severe

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<sup>1</sup> A ‘breadbasket’ is defined as “a region serving as a principal source of agriculture and grain supply” (Answers.com (2009) [www.answers.com/topic/breadbasket](http://www.answers.com/topic/breadbasket): Accessed: 2/7/2009). As recently as July 2009, Australia’s national broadcaster, the Australian Broadcasting Commission, described the Hunter and Liverpool Plains region as a food bowl and breadbasket of the nation (ABC, 2009b), while Senator Brett Mason described the region as a breadbasket “with an international reputation for fine wine and finer cuisine”(Mason, 2007).

<sup>2</sup> A ‘basket case’ is defined as “One that is in a completely hopeless or useless condition” Answers.com, (2009) <http://www.answers.com/topic/basket-case> Accessed: 2/7/2009).



anthropogenic stress. Approximately 60% of the ecosystem services that support life on Earth, such as fresh water and fisheries, are being degraded or used unsustainably (Millennium Ecosystem Assessment 2005). The loss of healthy ecosystems and biodiversity diminishes the potential of humans and other species to find the food, water, clean air and other essentials of life. As biodiversity shrinks, the balance of nature is disrupted and the physical, psychological and social health of humans is threatened (Costanza *et al.*, 1992; McMichael, 1993; Rapport *et al.*, 1998; Corvalen *et al.*, 2005; Connor *et al.*, 2004).

Climate change has emerged as a major threat to the linked health of ecosystems and humans, and some places and people are particularly vulnerable because of their high exposure to global warming's impacts (IPCC, 2007b). In contrast, some people are benefiting (at least in the short term) from the anthropogenic drivers of climate change, through direct economic and political benefits gained from the fossil fuel economy, including the coal economy which contributes roughly 20 percent of global greenhouse gases (Pew Center on Global Climate Change, 2008). Australia is a significant contributor to climate change through reliance on coal-fired power generation, and as the world's largest exporter of coal to the global economy. The Hunter Valley is arguably Australia's most significant climate change hot spot.<sup>3</sup> The region is Australia's largest direct and indirect contributor to climate change.

There are six coal-fired power stations located in the Hunter Valley, which between them generate about 40% of Australia's electricity supply. The Hunter Valley is also the site of some of Australia's most carbon-intensive industries, including two large aluminium smelters, which utilise a third of the coal-fired electricity generated in the region (NSW DPI, 2008; Saddler *et al.*, 2004; Diesendorf, 2007). However, the Hunter Valley's greatest contribution to global climate change is its coal export industry. The port of Newcastle, at the mouth of the Hunter River, is the world's largest coal export port currently exporting 100 million tonnes (Mt) of coal annually, with plans and investment underway to more than double exports over the next decade.

The Hunter Valley economy is not just jeopardising ecosystem health and sustainability at the regional scale, but, with each tonne of Hunter Valley coal burnt annually (locally and globally) contributing around 2.4 tonnes of carbon dioxide (or its equivalent<sup>4</sup>) to the global atmosphere (Australian Department of Climate Change, 2008: 12), the region's economy is jeopardising ecological and human health at the global scale, and therefore no longer has the qualities of a moral economy. The Hunter Valley has been labelled

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3 A 'hot-spot' is defined as 1. A place where there is a lot of exciting activity or variety: e.g. cultural and biodiversity hot spots 2. an area where there is fighting or political unrest: e.g. a political hot spot. 3. a small area of abnormally high temperature or radioactivity, e.g. urban areas, coal-fired power stations, Chernobyl (Collins Dictionary, 2006).

<sup>4</sup> Carbon dioxide equivalency (CO<sub>2</sub>e) is a quantity that describes, for a given mixture and amount of greenhouse gas, the amount of CO<sub>2</sub> that would have the same global warming potential (GWP), when measured over a specified timescale (generally, 100 years).



*Carbon Valley* by the region's major newspaper, the *Newcastle Herald*, which identified the region as:

A greenhouse capital ... in one of the world's biggest per-head producers of global warming gases (Ray, 2005a: 1).

Many millions of the world's poorest and most vulnerable people on Earth are already suffering from ecosystem collapse and climate change, and lack the adaptive capacity and resources to cope with loss of ecosystem services, natural disasters, food and water insecurity, conflict or economic dislocation due to climate change. Many of the most vulnerable people live in the vulnerable mega-deltas in Asia and Africa, the Arctic, small islands, and Africa generally (IPCC, 2007b; United Nations, 2008).

These linked crises pose an ethical, political and sustainability challenge for humanity and for governments, corporations and communities throughout the world. These challenges are particularly relevant to Australia and the Hunter Valley, as a nation and a region with a growing coal export economy that contributes directly to the global climate change problem.

Many of the impacts from climate change may not yet be apparent to all but it is the nature of complex adaptive systems that incremental changes can build up – often imperceptibly – and then cascade across domains to cause collapse of ecological and social systems. Many such rapid, unpredictable and uncontrollable collapses have occurred in ecosystems and human societies over time, and as this thesis is being written, leading climate scientists have warned that the world faces a growing risk of abrupt and irreversible climate shifts (Richardson, 2009). Under these circumstances it is likely that the ecosphere, and human communities living as part of it, will transform in fundamental ways in the near future, and while the trajectory of human responses to the climate change threat is not known, hopefully it will be towards sustainability rather than towards ecological and societal collapse and chaos.

This thesis investigates the potential of the Hunter Valley to make a transition to sustainability as part of local and global climate change mitigation strategies. It investigates two linked dimensions of this transition – a shift from coal-fired power generation to clean, renewable energy systems in the region, and a rapid phasing out of the region's coal export industry.

Fossil fuel use and climate change are linked issues at the centre of the quest for a sustainable future for humanity and all species. In 2005, the amount of carbon being emitted by human activities (our "Carbon Footprint") accounted for 45% of humanity's demands on the Earth's biologically productive land and sea (our "Ecological Footprint") (WWF, 2008a), with fossil fuel use, particularly coal, being the largest single contributor to humanity's Carbon Footprint and contribution to climate change (IPCC, 2007a, 2007b; WWF, 2008a).

Australia's per capita greenhouse gas emissions are among the highest in the world; according to Raupach (2007) Australia's per capita emissions in 2004 were 4.5 times the

global average, just below the value for the USA. In 2006, Australia's per capita emissions were 28.1 tonnes carbon dioxide equivalent (CO<sub>2</sub>e), nearly twice the Organisation for Economic Cooperation and Development (OECD) average (Australian Government Department of Climate Change, 2008; Garnaut, 2008).

Climate change is identified as a human rights issue by significant non-government organisations, such as Oxfam (Raworth, 2008), Greenpeace (Ananthapadmanabhan *et al.*, 2007), Friends of the Earth International (FOEI, 2006) and India's Centre for Science and Environment (Agarwal and Narain, 1991; CSE, 2008). The Oxfam report *Climate Wrongs and Human Rights: Putting People at the Heart of Climate Change Policy* (Raworth, 2008) highlighted that the wellbeing of the global human community and its environment are interconnected and that climate change is an emergent human rights issue that demands new responsibilities from people and governments of all countries. The report states:

When the Universal Declaration of Human Rights was drawn up in 1948, its authors could not have imagined the complex global interconnectedness that climate change would lead to today. But now it is clear that the devastating international impacts of greenhouse-gas emissions give countries undeniable international responsibility for the human-rights consequences of their policies (Raworth, 2008).

At the *Climate Change: Global Risks, Challenges, and Decisions* conference, held in Copenhagen, Denmark, in March 2009, scientists, economists and energy policy experts issued six key messages that serve as renewed and urgent reminders that CO<sub>2</sub> emissions must peak and then decline in the next six to 10 years to avoid abrupt or irreversible climatic shifts (Richardson *et al.*, 2009). The scientists issued a call to action for the global community, and particularly governments, leading up to the December 2009 United Nations Climate Change Conference, which will negotiate and adopt the international climate-change protocol that will replace the Kyoto Protocol, and guide global action over the next decade. The messages are reproduced in Table 1 below as they set a global context for this thesis.

**Table 1: Six key messages calling for urgent action on climate change**(From Richardson *et al.*, 2009: 6)

<p><b>Key Message 1: <i>Climatic trends</i></b></p> <p>Recent observations show that greenhouse gas emissions and many aspects of the climate are changing near the upper boundary of the IPCC range of projections. Many key climate indicators are already moving beyond the patterns of natural variability within which contemporary society and economy have developed and thrived. These indicators include global mean surface temperature, sea-level rise, global ocean temperature, Arctic sea ice extent, ocean acidification, and extreme climatic events. With unabated emissions, many trends in climate will likely accelerate, leading to an increasing risk of abrupt or irreversible climatic shifts.</p>
<p><b>Key Message 2: <i>Social and environmental disruption</i></b></p> <p>The research community provides much information to support discussions on “dangerous climate change”. Recent observations show that societies and ecosystems are highly vulnerable to even modest levels of climate change, with poor nations and communities, ecosystem services and biodiversity particularly at risk. Temperature rises above 2°C will be difficult for contemporary societies to cope with, and are likely to cause major societal and environmental disruptions through the rest of the century and beyond.</p>
<p><b>Key Message 3: <i>Long-term strategy: global targets and timetables</i></b></p> <p>Rapid, sustained, and effective mitigation based on coordinated global and regional action is required to avoid “dangerous climate change” regardless of how it is defined. Weaker targets for 2020 increase the risk of serious impacts, including the crossing of tipping points, and make the task of meeting 2050 targets more difficult and costly. Setting a credible long-term price for carbon and the adoption of policies that promote energy efficiency and low-carbon technologies are central to effective mitigation.</p>
<p><b>Key Message 4: <i>Equity dimensions</i></b></p> <p>Climate change is having, and will have, strongly differential effects on people within and between countries and regions, on this generation and future generations, and on human societies and the natural world. An effective, well-funded adaptation safety net is required for those people least capable of coping with climate change impacts, and equitable mitigation strategies are needed to protect the poor and most vulnerable. Tackling climate change should be seen as integral to the broader goals of enhancing socioeconomic development and equity throughout the world.</p>
<p><b>Key Message 5: <i>Inaction is inexcusable</i></b></p> <p>Society already has many tools and approaches – economic, technological, behavioural, and managerial – to deal effectively with the climate-change challenge. These tools reflect both mitigation and adaptation options, but if they are not vigorously and widely implemented the societal transformation required to decarbonise economies will not be achieved, and the challenge of adapting to the unavoidable climate change will be enormous, potentially overwhelming the capacity of many societies. On the other hand, a wide range of benefits will flow from a concerted effort to achieve effective and rapid adaptation and mitigation. These include job growth in the sustainable energy sector; reductions in the health, social, economic and environmental costs of climate change; and the repair of ecosystems and revitalisation of ecosystem services.</p>
<p><b>Key Message 6: <i>Meeting the challenge</i></b></p> <p>If the societal transformation required to meet the climate-change challenge is to be achieved, then a number of significant constraints must be overcome and critical opportunities seized. These include reducing inertia in social and economic systems; building on a growing public desire for governments to act on climate change; reducing activities that increase greenhouse gas emissions and reduce resilience (e.g. perverse subsidies); and enabling the shift from ineffective governance and weak institutions to innovative leadership in government, the private sector and civil society. Linking climate change with broader sustainable consumption and production concerns, human rights issues and democratic values is crucial for shifting societies towards more sustainable development pathways.</p>

Another report examining the impacts of climate change on the United States (Karl *et al*, 2009) reaffirms the risks from unanticipated impacts of climate change – such as major alterations in oceans, massive dislocations of species or pest outbreaks, and major shifts in wealth, technology, or societal priorities – and how this would affect humanity's ability to respond. These challenges will only become harder as carbon dioxide concentration increases.

The international environmental organisation Friends of the Earth recognises the human rights dimensions of climate change and argues for (Friends of the Earth International, 2006a):

The right for all peoples to have access to sufficient energy within ecological limits from appropriate sustainable sources for a dignified life.

Humans have a moral or ethical responsibility to mitigate climate change in an equitable way, and to assist vulnerable communities to cope with inevitable climate change impacts. However, humans also have an ethical responsibility to nature as a whole and to other species on the planet, which also have an intrinsic right to survive irrespective of whether they may, or may not be, useful to humans (Taylor, 1981; Regan and Singer, 1976; Devall and Sessions, 1985; Callicott, 1985; Shiva, 2005).

## *Sustainability*

The concept of sustainability, the capacity to endure, as an integrative organising principle for human societies emerged in public discourse in the 1980s, particularly after the release of the World Commission on Environment and Development report *Our Common Future* (WCED, 1987). The report refers to the capacity of ecosystems and human societies to persist and to provide the goods and services needed for life into the foreseeable future. Achieving sustainability is an ethical and social justice issue, as well as an environmental issue. The potential of life for billions of humans, and millions of other species, is in jeopardy as people living in the world's wealthiest societies – which have historically used a disproportionate share of the world's resources – continue to expand their consumption way beyond the Earth's carrying capacity. Indeed, the *Living Planet Report 2008* indicates that humanity is now consuming resources at a rate that by 2030 will require two planet Earths, and that people on a per capita basis in the USA, United Arab Emirates and Australia are consuming about four planet Earths to sustain their lifestyles (WWF, 2008a).

This thesis uses ecosystem health as an indicator of sustainability. Ecosystem health is a transdisciplinary concept that bridges the natural, social, and health sciences. A healthy ecosystem is a social-ecological unit that maintains its integrity, vigour, resilience, and its characteristic composition, organisation, and function over time, while remaining economically viable and sustaining human communities (Costanza 1992, Haskell *et al*, 1992; Rapport 1998). In an unhealthy ecosystem, functions that provide essential services for life become impaired and ecosystem distress syndromes become apparent (Rapport *et al*, 1998). These distress syndromes include loss of productivity, loss of species diversity

and changes to biotic structure, pest and disease prevalence, and loss of soil fertility. In many cases, ecosystem distress syndrome is linked to increased disease incidence and physical, psychological and social wellbeing in humans and other species, and thus the sustainability of the social and ecological systems they inhabit (Rapport, Costanza and McMichael, 1998; McMichael, 1993; Corvalen *et al.*, 2005; Albrecht, 2005).

Social ecologist Murray Bookchin (1980) argued that sustainability is possible only if human-nature relationships could be brought back into alignment and balance. He proposed that (Bookchin, 1989:171):

[Human] interest centres around the establishment of a harmonious balance with nature. Our viability as a species depends on our future relationship with the natural world.

Furthermore, as Bookchin also noted, nearly all ecological problems have their roots in social problems, and thus there is an urgent need for human societies to “search out the relationship of society to nature” (Bookchin, 1989: 24) and simultaneously address social and ecological components of non-sustainability. Bookchin described the urgent challenge of humans creating an “ecological society” through “bringing society back into the ecological picture” (Bookchin, 1989: 24) and investigating “how social evolution can be situated in natural evolution” (Bookchin, 1989: 38).

Bookchin’s social ecological propositions, and the calls by non-government organisations such as Oxfam that climate change is a human rights issue, are powerful motivations for this thesis which investigates how a particular region of the world – the Hunter Valley - can make a transition to sustainability in such a way that ethical and ecologically-grounded human-human relationships and human-nature relationships can be created at local, regional, national and global scales.<sup>5</sup>

### *Beyond tinkering*

According to Bookchin, achieving an “ecological society” requires more than just “tinkering with existing institutions, social relations, technologies and values [but] rather [requires] changing them” (Bookchin 1980: 77). Many other commentators on the global ecological and sustainability challenges have also supported this view, but in their own distinctive approaches (Schumacher, 1973; Commoner, 1975; Daly and Cobb, 1989; Merchant, 1992; Brown *et al.*, 1992; Meadows *et al.*, 1992; Beder, 1996; Doherty and Geus, 1996; Costanza *et al.*, 2001; Dobson, 2003; Eckersley, 2004; Elliott, 2004; Dryzek, 2005; Shiva, 2005; Clapp and Dauvergne, 2005; Lovelock, 2006; Raskin *et al.*, 2006).

Institutional change needs to redress the failures of governments and markets to change non-sustainable patterns of growth, production and consumption. Such change needs to

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<sup>5</sup> For the purposes of this thesis, local refers to neighbourhood, township or city scale of social organisation (for example, Muswellbrook or Newcastle) within the larger regional spatial scale. Regional scale generally refers to a bioregional spatial scale (such as the Hunter Valley). National, continental or global scales are also referred to throughout the thesis.

be a process that empowers communities with the capacity to mobilise and exercise countervailing power to those social forces that maintain non-sustainable states that are proving perversely resilient, and thus obstinately keeping human societies in a pathological state that is harmful to the health of people and the planet.

This thesis investigates the pathological state of the Hunter Valley socio-ecological system that is locked into fossil fuel dependency. It investigates how the perverse resilience (Ráez-Luna, 2008) of the Hunter Valley's current status as a climate-change hot spot can be replaced by the genuine resilience of an ecological society in a healthy ecosystem, in which thousands of new "Green jobs" can be created that replace jobs lost in industries that contribute to non-sustainability. Perverse resilience occurs where pathological social relationships that are oppressive and exploitative of humans and ecosystems are rendered resistant to change by political support, including economic subsidies.

Green jobs have been defined in various ways. The Green Jobs Initiative of the United Nations Environment Program (UNEP), the International Labor Organization (ILO) and the International Trade Union Confederation (ITUC) defined Green jobs as:

Positions in agriculture, manufacturing, R&D, administrative, and service activities aimed at alleviating the myriad environmental threats faced by humanity. Specifically, but not exclusively, this includes jobs that help to protect and restore ecosystems and biodiversity, reduce energy consumption, decarbonizes the economy, and minimize or altogether avoid the generation of all forms of waste and pollution. A successful strategy to green the economy involves environmental and social full-cost pricing of energy and materials inputs, in order to discourage unsustainable patterns of production and consumption. A green economy is an economy that values both nature and people and creates decent and adequately paid jobs (UNEP, 2008: 7).

Van Jones, the founder of the US organisation *Green For All* which has campaigned strongly for Green job creation in low-income communities, emphasises its potential to tackle both poverty and climate change simultaneously. From March to September 2009 Jones was a special adviser to US President Barack Obama on Green jobs. Jones defines a Green job as:

Family-supporting, career-track job that directly contributes to preserving or enhancing environmental quality. Like traditional blue-collar jobs, green-collar jobs range from low-skill, entry-level positions to high-skill, higher-paid jobs and include opportunities for advancement in both skills and wages. Think of them as the 2.0 version of old-fashioned blue-collar jobs, upgraded to respect the Earth and meet the environmental challenges of today (Jones, 2008: 12).

Like Jones, trade unions emphasise job quality as an essential feature of a Green job, including security, safety and fair pay levels for the work done. The Canadian Labour Congress definition of Green jobs is a useful and succinct definition which captures the concept as it is used in this thesis:



Secure, quality, fairly paid jobs which are clean, healthy and stress-free and which have a direct, positive impact on the environment (Canadian Labour Congress, 2000: 1).

Clean energy is another concept with multiple and contested definitions. The Minerals Council of Australia (MCA), the peak body of coalminers and the minerals industry in Australia, uses the definition of clean energy proposed by the Cambridge Energy Research Associates (Banville *et al.* 2006), namely:

A set of new and conventional energy technologies that, alone or in combination, can (1) provide energy with a minimal carbon footprint to help address climate change, and (2) facilitate greater energy security through broader diversity of fuels and technologies -all at prices that are politically acceptable and conducive to economic growth and development (cited in MCA, 2008c: 3)

The industry likes this broad-ranging definition of clean energy because it includes so-called “clean coal” with carbon capture and storage of CO<sub>2</sub> emissions within its ambit (MCA, 2008c).

However, the end-use impacts of a mineral’s use cannot be seen in isolation from the impacts of its mining and processing, and recognising the impacts of coalmining on the air, water and landscape of the Hunter Valley, coal cannot be regarded as “clean”. Also, unlike renewable energy technologies, carbon capture and storage technologies are unproven and not currently deployed. Therefore, “clean coal” is not accepted as clean energy for the purposes of this thesis, and rather than the MCA’s preferred definition this researcher uses the definition of clean energy proposed by the Washington DC-based Pew Centre, which refers to:

Jobs, businesses and investments that produce, transmit and store clean, renewable power from solar, wind, low-impact hydro, hydrogen fuel cells, marine and tidal, geothermal and small-scale biopower energy sources (Pew Charitable Trusts, 2009: 12).

### *A convergence of social and ecological crises*

At the time of writing this thesis, the world is experiencing a coincidence of major global crises: massive and irreversible species extinction and biodiversity loss; persistent global poverty; extensive violence and war; global financial system collapse; and the threat of runaway climate change. These actual problems and threats, together and separately, indicate the non-sustainability and potential collapse of the dominant social, economic, political and cultural regimes governing human societies and human relationships with nature. Many human societies have collapsed throughout history because of their inability to develop cultures and governance regimes that enabled them to live within available resources and to absorb shocks (Weiss and Bradley, 2001; Diamond, 2005; Costanza *et al.*, 2007; Ponting, 2007).

The capacity of human social systems and the ecological systems in which they are located, known as socio-ecological systems (Berkes and Folke, 1998), to withstand shock

is a measure of their resilience (Walker *et al.*, 2004). Hopefully, there will be a positive aspect of the convergence of current crises and humanity will take them as a wake-up call for new learning, values change and the transformation of institutions of governance so that a transition to ecological sustainability and global justice is possible. This thesis will demonstrate that the Hunter Valley is an excellent case study of threats to, and opportunities for, achieving a transition to genuine resilience and sustainability at a regional scale based on analysis of current and emergent drivers and trends.

The Hunter Valley case study is relevant to other regions of the world that are also engaged in non-sustainable economic activities from which a transition needs to be made. In other regions the dominant driver of non-sustainability might also be reliance on fossil fuels, or it might be another non-sustainable industry, perhaps over-fishing, toxic chemical industries, or narcotics production.

There are many regions throughout Australia and globally that host industries that are potentially sustainable, such as agriculture, tourism or manufacture but are currently vulnerable due to ecological collapse or economic restructuring. Mapping a potential pathway to sustainability, grounded in maintaining the health of environmental assets and protecting the wellbeing of displaced workers and at risk communities is essential if human communities are to overcome linked ecological and social crises.