

The Eye of the Storm
**An Integral Perspective on Sustainable Development
and Climate Change Response**

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CERTIFICATE OF AUTHORSHIP/ORIGINALITY

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

Signature of Candidate

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Relevant Publications

Some of the research reported in this thesis was originally published elsewhere. I have listed relevant research publications arising from my PhD research below.

Refereed Publications

Riedy, C 2002, 'Business as Usual in the Australian Energy Sector: Utopia in Disguise', *Proceedings of the Environmental Engineering Research Event 2002*, Blackheath, NSW, 3-6 December 2002.

Riedy, C 2003, 'A Framework for Economic Analysis of Greenhouse Abatement Options', *Proceedings of the 2003 National Workshop of the Economics and Environment Network*, Canberra, ACT, 2-3 May 2003, <http://ecn.anu.edu.au/workshop.html>

Riedy, C and Diesendorf, M 2003, 'Financial Subsidies and Incentives to the Australian Fossil Fuel Industry', *Energy Policy*, 31 (2), pp.125-137.

Riedy, C 2004, 'Vintage Stock Modelling of Domestic Appliances: Dealing With Uncertainties', in P Bertoldi, F Conti & R Pagani (eds), *Energy Efficiency in Domestic Appliances and Lighting: Proceedings of the 3rd International Conference on Energy Efficiency in Domestic Appliances and Lighting*, Part 2, Softech, Turin, Italy, pp. 697-710.

White, S, Milne, G & Riedy, C 2004, 'End Use Analysis: Issues and Lessons', *Water Science and Technology: Water Supply*, 4 (3), pp.57-65.

Saddler, H, Riedy, C & Passey, R 2004, *Geosequestration: What is it and How Much can it Contribute to a Sustainable Energy Policy for Australia?*, Discussion Paper Number 72, The Australia Institute, Canberra, September.

Conference Papers – Abstract Refereed

Riedy, C 2001, 'Using Backcasting to Identify Sustainable Futures', In: *Proceedings of 3rd Annual UTS Students' Association & University Graduate School Postgraduate Research Students' Conference*, Sydney, NSW, 17 August 2001.

Riedy, C 2002, 'Government Subsidies to the Australian Fossil Fuel Industry', *Australia and New Zealand Society for Ecological Economics 2002 Conference on Ecologically Sustainable Development*, Sydney, NSW, 2-3 December 2002.

White, S, Milne, G & Riedy, C 2003, 'End Use Analysis: Issues and Lessons', *Efficient 2003: Efficient Use and Management of Water for Urban Supply Conference*, Tenerife, Canary Islands, 2-4 April 2003.

Riedy, C 2003, 'A Deeper and Wider Understanding of Sustainable Development', *Ecopolitics XIV Conference: Greening Sustainability*, Melbourne, Victoria, 27-29 November 2003.

Riedy, C 2004, 'A Developmental Perspective on Climate Policy Discourse', *5th Asia-Pacific Rim Universities Doctoral Students Conference*, Sydney, 9-13 August 2004.

Preface

This is a thesis in sustainable futures. Sustainable development and the future are topics that cut across traditional disciplinary boundaries. There is much overlap between the sustainable development literature and the futures literature; the concept of sustainable development is explicitly long-term and future-oriented, and most explorations of the future are committed to sustaining human civilisation. The marriage of these two concepts and literatures in the term **sustainable futures** is a natural one. Sustainable and desirable futures will require action by people from all disciplinary backgrounds, all walks of life. Integration and synthesis of specialist disciplinary knowledge that is presently compartmentalised is a central challenge for researchers interested in sustainable and desirable futures. In this thesis, I attempt integration and synthesis of work from diverse fields related to sustainability.

This thesis is also intended as an example of integral futures work. Futures work in general, and integral futures work particularly, draws on numerous disciplines to explore the implications of probable, possible and preferable futures. Therefore, as an integral futures perspective on sustainable development, this thesis is unavoidably and unashamedly cross-disciplinary.

A cross-disciplinary thesis asks more of the reader, and ranges more widely, than a traditional PhD thesis. It may introduce the reader to disciplines with which they are not familiar, challenging them to understand not just new material, but new ways of thinking about or approaching reality. To help the reader to engage with these new disciplines, a cross-disciplinary thesis may include more introductory material, and assume less knowledge. As a result, some sections of this thesis may seem basic to the reader who is familiar with that discipline, while others may pose more of a challenge. I hope that the insights provided by a cross-disciplinary and integral approach outweigh the challenges to the reader. Nevertheless, I ask for your patience with material that is unfamiliar or too familiar.

When I began the research reported in this thesis I was not familiar with integral philosophy, let alone the emerging applications of this philosophy to futures work and many other fields, from ecology, to politics, to art, to sustainable development. The original intent of my research was to develop energy and greenhouse response scenarios for Australia using backcasting, systems theory and spreadsheet modelling, over the period 2000 to 2030. I hoped to identify technically and economically feasible pathways to achieve a 50 per cent reduction in Australia's energy-related greenhouse gas emissions by 2030. The resulting scenarios would provide images of a sustainable energy future to challenge the unsustainable futures promoted by Australian governments and businesses.

As an environmental engineer, trained primarily in science and mathematics, I initially approached the research as a difficult modelling exercise, requiring a long period of data collection and analysis. However, after reviewing the diverse literature on the study of the future, I came to question the

value of such a modelling exercise. Specifically, I became aware of the crucial role of subjectivity in our perceptions of the future. Any scenario I created, no matter how detailed, would only serve to project my particular values, and perhaps those of other research participants, into the future. It seemed to me that this would do little to influence those who were committed to existing energy and greenhouse policies, as their values appeared quite different to my own. This realisation led to something of a crisis in the research, where I questioned the value of continuing.

Fortuitously, around this time, I discovered the work of Ken Wilber and the emerging field I have called **integral theory** in this thesis. I also discovered Richard Slaughter's specific application of integral theory to futures studies. Integral theory provided an explanation for the crisis in my research, and offered a way forward. After reading Wilber's *A Brief History of Everything*, I realised that my original research proposal was trapped in the 'flatland' he describes.¹ My proposed modelling exercise would provide a useful objective map of the types of technological and economic development required to substantially reduce Australia's greenhouse gas emissions. But this map would ignore the crucial role of subjective values in determining the shape of the future. It would be a map with no depth, uninformed by an understanding of the interior transformations required to bring about a sustainable energy future. I began to realise that a truly holistic and sustainable approach to development had to consider both exterior and interior development.

With this realisation, my research began to take a very different shape. My grounding in the social sciences and my understanding of subjectivity was not sufficient to allow an immediate switch to an integral perspective. Indeed, it took at least a year for the implications of Wilber's writing for my research to become clear and another year before I began to think of my work as an attempt to apply an integral approach. However, having realised the inherent limitations of my research, I could not be satisfied unless I attempted a more integral approach, sensitive to both the objective and the subjective. As Wilber puts it: 'I don't know of any intelligent person who, after studying and grasping the integral overview, chooses a narrower alternative' (Wilber 2004, p.xi).

I hope that the resulting thesis makes a useful contribution to the development of integral studies as a valid field of academic inquiry and helps to demonstrate that sustainable development must be both objective and subjective. There is much to gain from dialogue between integral theorists, futurists and advocates of sustainable development. I look forward to participating in this ongoing conversation.

Christopher Riedy

November 2004, Sydney, Australia

¹ Flatland is Wilber's term for a world of surfaces, without any depth or meaning, obsessed with objective exteriors and ignorant of subjective interiors. For more on flatland, see Section 2.4.4.

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Abbreviations and units

4WD	Four-wheel drive
ABARE	Australian Bureau of Agricultural and Resource Economics
ABC	Australian Broadcasting Corporation
ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
ACF	Australian Conservation Foundation
ACIS	Automotive Competitiveness & Investment Scheme
AGC	The Allen Consulting Group
ACRE	Australian CRC for Renewable Energy
AEMC	Australian Energy Market Commission
<i>AEC</i>	Annual energy consumption
AER	Australian Energy Regulator
AFCF	Alternative Fuels Conversion Program
AGO	Australian Greenhouse Office
APPEA	Australian Petroleum Production and Exploration Association
AQAL	All-quadrants, all-levels
ASPO	Association for the Study of Peak Oil
ATSE	Academy of Technological Sciences and Engineering
BASIX	Building Sustainability Index (NSW)
BCSE	Business Council for Sustainable Energy
BTE	Bureau of Transport Economics
C&C	Contraction and convergence
CANA	Climate Action Network Australia
CBD	Central business district
CBSR	Colmar Brunton Social Research
CCS	Carbon capture and sequestration
CDM	Clean Development Mechanism (part of the Kyoto Protocol)
CFCs	Chlorofluorocarbons
CFS	Critical futures studies
CGE	Computable general equilibrium
CH ₄	Methane
CHP	Combined heat and power
CIRA	Center for Integrated Regional Assessment
CLA	Causal layered analysis
CNG	Compressed natural gas
CO	Carbon monoxide

CO ₂	Carbon dioxide
CO ₂ CRC	CRC for Greenhouse Gas Technologies
COAG	Council of Australian Governments
COOL	Climate Options for the Long Term
COP	Conference of the Parties
CRC	Cooperative Research Centre
CSD	(United Nations) Commission on Sustainable Development
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFGS	Diesel and Alternative Fuels Grants Scheme
DEC	Department of Environment and Conservation (NSW)
DECADE	Domestic Equipment and Carbon Dioxide Emissions
DEH	Department for Environment and Heritage (Commonwealth)
DEUS	Department of Energy, Utilities and Sustainability (NSW)
DFAT	Department of Foreign Affairs and Trade (Commonwealth)
DG	Distributed generation
DITR	Department of Industry, Tourism and Resources (Commonwealth)
DNDE	Department of National Development and Energy
DNSP	Distribution network service provider
DOE	Department of Energy (US)
DPIE	Department of Primary Industries and Energy
DRE	Department of Resources and Energy
E2WG	Energy Efficiency Working Group
ECI	Environmental Change Institute (Oxford University)
ECITA	Environment, Communications, Information Technology and the Arts (Committee)
EES	Energy Efficient Strategies
EGCS	Energy Grants Credits Scheme
ES	Energy Strategies
ESAA	Energy Supply Association of Australia
ESD	Ecologically sustainable development
FAR	First Assessment Report (IPCC)
FBT	Fringe Benefits Tax
FCCC	Framework Convention on Climate Change
FEC	Final energy consumption
FF	Fossil fuel
FS	Futures studies
FSGS	Fuel Sales Grants Scheme
GCI	Global Commons Institute
GCM	General Circulation Model

GDP	Gross domestic product
GHG	Greenhouse gas
GNP	Gross national product
GRI	Global Reporting Initiative
GSP	Gross state product
GST	Goods and Services Tax
Gt	Gigatonnes
GtC	Gigatonnes of carbon
GWA	George Wilkenfeld & Associates
GWh	Gigawatt hours
HCFC	Hydrochlorofluorocarbon
HF ₆	Sulphur hexafluoride
HFC	Hydrofluorocarbon
IA	Integrated assessment
IAP	Integrated abatement planning
IAP2	International Association for Public Participation
IEA	International Energy Agency
IGCC	Integrated gasification combined cycle
IPART	Independent Pricing and Regulatory Tribunal of NSW
IPCC	Intergovernmental Panel on Climate Change
IRP	Integrated resource planning
KP	Kyoto Protocol
LBNL	Lawrence Berkeley National Laboratory (US)
LCA	Life cycle assessment
LCP	Least cost planning
LCT	Luxury Car Tax
LCV	Light commercial vehicle
LETAG	Lower Emissions Technology Advisory Group
LETDF	Low Emissions Technology Demonstration Fund
LL	Lower-Left (cultural quadrant)
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
LR	Lower-Right (social quadrant)
MCE	Ministerial Council on Energy
MCMPR	Ministerial Council on Mineral and Petroleum Resources
MEFL	Moreland Energy Foundation Limited
MEPS	Minimum energy performance standards
MIPS	Material input per unit service

MMA	McLennan Magasanik Associates
MFP	Major Projects Facilitation
MRET	Mandatory renewable energy target
Mt CO ₂ -e	Megatonnes of carbon dioxide equivalent
MW	Megawatts
N ₂ O	Nitrous oxide
NAEEEC	National Appliance and Equipment Energy Efficiency Committee
NAEEEP	National Appliance and Equipment Energy Efficiency Program
NCSO	National Council for Sustainable Development
NEC	National Electricity Code
NECA	National Electricity Code Authority
NECF	National Environmental Consultative Forum
NEM	National Electricity Market
NEMMCO	National Electricity Market Management Company
NFEE	National Framework for Energy Efficiency
NGAC	NSW Greenhouse Abatement Certificate
NGO	Non-government organisation
NGRS	National Greenhouse Response Strategy (1992)
NGS	National Greenhouse Strategy (1998)
NO _x	Oxides of nitrogen
NSW	New South Wales
NTC	National Transport Commission
O ₃	Ozone
OECD	Organisation for Economic Cooperation and Development
ORER	Office of the Renewable Energy Regulator
OSL	Ownership/service life (a type of vintage stock model)
PEC	Primary energy consumption
PFC	Perfluorocarbon
PIAC	Public Interest Advocacy Centre
PJ	Petajoules
PMV	Passenger motor vehicle
ppmv	Parts per million by volume
PPP	Purchasing power parity
PRRT	Petroleum Resource Rent Tax
PV	Photovoltaic
R&D	Research and development
RA	Redsuit Advertising
RAF	Retirement adjustment factor

RCEP	Royal Commission on Environmental Pollution (UK)
RE	Renewable energy
REC	Renewable Energy Certificate
SAR	Second Assessment Report (IPCC)
SCO	Standing Committee of Officials
SEAC	State of the Environment Advisory Council (Australia)
SEAV	Sustainable Energy Authority Victoria
SEDA	Sustainable Energy Development Authority (NSW)
SESSWG	Strategic Energy Supply and Security Working Group
SRES	Special Report on Emissions Scenarios (IPCC)
TAI	The Australia Institute
TAR	Third Assessment Report (IPCC)
TBL	Triple bottom line
TEC	Total Environment Centre
TES	Tax Expenditures Statement
TIC	Techno-Institutional Complex
TNSP	Transmission network service provider
UCAP	Utilities Consumer Advocacy Project
<i>UEC</i>	Unit energy consumption
UK	United Kingdom
UL	Upper-Left (intentional quadrant)
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UR	Upper-Right (behavioural quadrant)
US	United States of America
W/m ²	Watts per square metre
WCED	World Commission on Environment and Development
WMO	World Meteorological Organization
WSSD	World Summit on Sustainable Development (held in Johannesburg, 2002)
WST	Wholesale Sales Tax
WWF	Acronym originally derived from World Wildlife Fund, later redefined as World Wide Fund for Nature, and now used as an actual name

Abstract

In this thesis, I explore the implications of integral theory for sustainable development and climate change response. Integral theory seeks to integrate objective and subjective perspectives using a developmental orientation. It addresses issues of subjectivity that have received inadequate attention in mainstream approaches to sustainable development, while also providing theoretical grounding for the developmental aspect of sustainable development. According to integral theory, there are four main epistemological approaches to any problem: behavioural, systemic, psychological and cultural. The first is objective and individual, the second objective and collective, the third subjective and individual and the fourth subjective and collective. Development occurs within each of these realms.

To test the value and implications of integral theory for sustainable development, I adopt a case study on climate change response in Australia. I begin the case study by using the four perspectives of integral theory to guide a review of the energy and climate change literature. I follow the literature review with a critical review of Australian energy and greenhouse policy, providing the starting point for development of an integral climate change response. While there is attention to subjectivity in the literature, it is not reflected in Australian policy practices. An objective perspective and an instrumental form of rationality dominate policy.

In the literature review, I identify two gaps in the literature that deserve attention. The first is the role of public subsidies in creating the observed cost differential between renewable energy sources and fossil fuel energy. I examine the relative magnitude of subsidies to fossil fuels and renewable energy in the Australian energy and transport sectors and conclude that the distribution of these subsidies distorts the market in favour of fossil fuels, particularly in the transport sector. The second is the application of a developmental perspective to cultural theories of climate policy discourse. I introduce a method called meta-discourse analysis to identify consistencies and relationships across discourse descriptions by different authors and demonstrate that aspects of each discourse can be related developmentally.

Drawing on the literature review, policy review and other work, I propose an integral policy response to climate change that could be applied in Australia. The policy response combines participatory integrated assessment, normative futures work, a modified version of the cooperative discourse model for public participation, an evolutionary policy orientation and several methods to promote subjective development. The proposed policy approach should be equally applicable to other sustainable development issues.

