

## This book is dedicated to

*You who have for so long implored us to take a more sensible path.  
 You who are committing yourself to reshaping our social norms  
 and healing our ailing planet.  
 You who are young and yet to come.  
 You must bear the brunt of our excesses.*

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## Author biographies



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**Roger Diamond** has an MSc in Geology from the University of Cape Town. He has worked as an exploration geologist and hydrogeologist in Australia. Environmental concerns compelled him to work in waste management for the Western Cape government, before moving to Environmental Science Associates ([www.escience.co.za](http://www.escience.co.za)), specialising in environmental projects, such as EIA, and legal compliance auditing and training, which has included work for the "green scorpions".



**Amanda Dinan** is a freelance contributor in the financial services and CDM sectors. Her interest in environmental issues led from a career in town and regional planning to postgraduate studies in environmental science and resource economics. Following 10 years in environmental assessment and management, she joined Frater Asset Management in 2001, where she focused on establishing the firm's responsible investment funds, climate change and shareholder value, and energy security issues.



**Morné du Plessis** is the CEO of WWF South Africa ([www.panda.org.za](http://www.panda.org.za)). He previously headed the DST/NRF Centre of Excellence at the Percy FitzPatrick Institute at the University of Cape Town, and before that was Assistant Director of Biodiversity Research at the former Natal Parks Board. He holds a BSc in agriculture from the University of Stellenbosch, an Honours in mammalogy from the University of Pretoria, and a PhD and an MBA from the University of Cape Town.



**Peet du Plooy** is Advisor to WWF's Trade & Investment Programme in South Africa, which promotes leadership among developing economies in the provision of environmental goods and services (EGS) and supporting policy. He has authored key reports on foreign investments and corporate attitudes relating to environmental sustainability. Previously he worked for Eskom on process optimisation in their R&D division. Peet holds a degree in mechanical engineering.



**Tess Fairweather** has lived and set up businesses on three continents and is essentially a practical problem solver ([www.tessfairweather.com](http://www.tessfairweather.com)). Her writing currently focuses on economic and transformational development, utilising all available channels of communication, from business plans to broadsheets and from news media to screenwriting. She is also involved in training and mentoring. Tess is chairperson of the Southern African Freelancers Association ([www.safrea.co.za](http://www.safrea.co.za)).



**William Frater** worked for the labour movement and in development and policy NGOs in South Africa. He co-founded Frater Asset Management, spearheading shareholder advocacy on governance and stakeholder issues, and in this capacity has spoken widely at conferences on corporate social responsibility, shareholder activism and changing corporate behaviour. In 2007, he left the field of asset management and co-established CleanSource Energy, which adapts cutting-edge energy-efficient technologies. William studied at the universities of Cape Town and Cambridge.



**Yolán Friedmann** is the CEO of the Endangered Wildlife Trust ([www.ewt.org.za](http://www.ewt.org.za)), one of the largest conservation NGOs in southern Africa addressing threats to biodiversity through applied conservation action. She is also chair of the South African IUCN National Member's Committee, was chair of the Regional Advisory Committee of the IUCN's Regional Office and contributed to the 2007 South Africa's Environmental Outlook (SAEO) biodiversity chapter. Yolán's qualifications include veterinary nursing, a BA and an MSc in environmental management.



**Andy Horn** is recognised as one of South Africa's pioneering green architects and has won a number of local and international awards for his work. Graduating from the University of Cape Town as an architect, he has worked, published, lectured and exhibited locally and internationally. In 1998, out of a life-long concern for the rapidly degrading natural environment and widening social inequalities, Andy founded the Cape Town-based Eco Design Architects and Consultants ([www.ecodesignarchitects.co.za](http://www.ecodesignarchitects.co.za)).



**Andrew Janisch** is an electronic and electrical engineer and works as a project manager at Sustainable Energy Africa (SEA, [www.sustainable.org.za](http://www.sustainable.org.za)). Prior to this, he worked in the project management field for five years and pursued a career in music. His concern for the growing planetary crises led him to his current position. Andrew's work includes government renewable energy and energy-efficiency advocacy, solar water-heater mass implementation projects and sustainable transport.



**Leonie Joubert** is a widely published science journalist and author of *Scorched: South Africa's Changing Climate* and *Boiling Point*. Leonie contributed to the 2007 John Platter Wine Guide and co-authored the new Environmental Management Plan (EMP) for the Prince Edward Islands Special Nature Reserve. Leonie has a BA in journalism and media studies (Rhodes), an MPhil in journalism (Stellenbosch) and was the 2007 Ruth First Fellow (Witwatersrand University).



**Nick King** is CEO of the Global Biodiversity Information Facility ([www.gbif.org](http://www.gbif.org)) in Copenhagen, Denmark. He is a former CEO of the Endangered Wildlife Trust ([www.ewt.org.za](http://www.ewt.org.za)) and was an integrative writer of South Africa's Environmental Outlook (SAEO) report. Nick has an LLM in environmental law (UK), a PhD in technology management (US) and an MSc in ecology from the University of KwaZulu-Natal. Nick has over 20 years' experience in environmental management and sustainable development research, planning and implementation.



**Duncan Miller** is a materials scientist and science writer, with PhDs in both materials engineering and archaeological science. He is a Fellow of the Gemmological Association of Great Britain. He has numerous academic publications in archaeology and materials engineering. His current activities include specialist technical editing for various publishers, and writing about sustainability, Earth stewardship science and geology. He also teaches mineralogy and gemmology.



**Gordon Pirie** is Professor at the Department of Geography and Environmental Studies at the University of the Western Cape, where he teaches and researches, mainly in the field of transportation. Gordon has taught and studied at the University of the Witwatersrand, MIT (US) and the University of Salford (UK). He has written extensively about mobility history, especially rail, road and air transport and travel under colonialism and apartheid.



**Stef Raubenheimer** is a lawyer (BA, LLB), an arbitrator, mediator, facilitator and trainer and is also CEO of SouthSouthNorth ([www.southsouthnorth.org](http://www.southsouthnorth.org)), which has played a leading role in climate change since 1999. He facilitates large projects, notably the South African Cabinet-mandated Long Term Mitigation Scenario Planning Project (LTMS). Stef has helped establish several African Designated National Authorities, has undertaken projects for the Development Bank of Southern Africa and is a senior associate of the Cambridge Programme for Industry.



**Niël Roux** is a Research Project Manager in the Department of Social Development ([www.population.gov.za](http://www.population.gov.za)), where he conducts and manages population- and development-related research projects that assist in policy formulation and implementation. He holds a Master's degree in Demography from the University of Pretoria and is interested mainly in the study of internal migration in South Africa, particularly its relationship to health and environmental conditions.



**Linda Scott** studied epidemiology and genetics at Oxford University, graduating with an MA in 1981. She has earned an MSc in nutritional medicine at Surrey University and is currently conducting doctoral research with the Desmond Tutu HIV Centre and Surrey University to assess the effect of selenium on HIV disease progression. She has co-authored three books on nutrition and has written widely about the role of nutrition in preventing and treating disease in both professional and lay publications.



**Mark Swilling** is Professor and Academic Director of the Sustainability Institute ([www.sustainabilityinstitute.net](http://www.sustainabilityinstitute.net)), and Head of the Division: Sustainable Development Planning and Management at the School of Public Management and Planning, University of Stellenbosch. Previously, he co-founded and directed the Graduate School of Public and Development Management at the University of the Witwatersrand. He has a PhD from the University of Warwick. He is also a member of an international panel of experts on sustainable resource planning.



**Lisa Thompson-Smeddle** is Research Coordinator at the Sustainability Institute (Stellenbosch University), where she coordinates three United Nations Development Program projects: sustainable future scenarios for the City of Cape Town, biofuel feasibilities and the Sustainable Urban Resources Forum web portal ([www.sustainableneighbourhoods.co.za](http://www.sustainableneighbourhoods.co.za)). She has a social sciences degree (Chapman University, California,) a B.Phil in sustainable development (Sustainability Institute) and is currently completing her Masters degree in sustainable settlements.



**Johan van den Berg** is the founder and CEO of CDM Africa, a specialist advisor to CDM project developers, and presently advises nine projects in South Africa, Kenya and Uganda. He has lectured on CDM courses at conferences and universities and facilitated the first international CDM conference in southern Africa. Prior to this, Johan practised as an advocate at the Cape Bar for 10 years, specialising in environmental law. In 2000, he moved full time into climate-change work.



**Jeremy Wakeford** is an independent energy and sustainability consultant. He has Master's degrees in economics from the universities of Cape Town and Cambridge. Until recently, he was a senior lecturer in the School of Economics at UCT. Jeremy's research emphasis has been energy and sustainable development, with a focus on the socio-economic implications of global oil depletion for South Africa. He is Research Director of the Association for the Study of Peak Oil South Africa.



**Harald Winkler** is Associate Professor at the University of Cape Town's Energy Research Centre, here writing in his personal capacity. He holds a PhD and MA (UCT) and an MSc in energy and resources (UC Berkeley). He has worked on long-term mitigation scenarios for South Africa and policies for renewable energy and energy efficiency. Harald was a lead author on IPCC AR4 Working Group III on mitigation and sustainable development, and is a member of the country's delegation for the UN Framework Convention on Climate Change negotiations.



**Richard Worthington** is coordinator of the Sustainable Energy and Climate Change Project (SECCP) at Earthlife Africa (ELA, [www.earthlife.org.za](http://www.earthlife.org.za)) in Johannesburg and also coordinates the South African Climate Action Network (SACAN, [www.climatenetwork.org](http://www.climatenetwork.org)). ELA is a civil society organisation working on environmental and social justice issues. He has also served on the board of the global Climate Action Network (CAN) from 2003 through 2007. Richard has a BA (University of Witwatersrand) and a BSc (Hon) in energy studies (University of Johannesburg).



**Robert Ziplies** consults to organisations wishing to deepen their environmental and social commitment. Previously he has worked in venture capital, Internet payment systems, management consulting and the steel industry. However, a growing concern about the state of our environment and society led him to take up sustainability consulting, where, until recently, he worked with Incite Sustainability. He has an MSc in industrial engineering (University of the Witwatersrand) and an MBA (Rotterdam School of Management, Netherlands).

# Foreword

Marthinus van Schalkwyk

Minister of Environmental Affairs and Tourism

It is exciting to see a home-grown South African book, such as this, emerging to influence the debate and future course of individual and societal action on climate change. It attests to the gratifying increase in interest and concern on this issue. In this country, world-class research has moved rapidly from the academic arena to that of policy influence – and a book like this injects the findings and ideas that have resulted into the sphere of public response and involvement even more forcefully. I am proud that our government, business and civil society response has placed South Africa amongst the leading voices in the international debate on climate change – *Bending the Curve* will help to raise our response even further.

Whether it is natural disasters, which happen with increasing frequency and severity around the globe, or human conflict arising over the competition for resources, the impacts of climate change are global phenomena that continue to make world headlines. Africa will come under particular pressure due to rising temperatures and shifting weather patterns. But it is sometimes difficult for South Africans to relate these alarming projections to their own lives, and to know what effective options may be available to them.

Let us not delude ourselves. Climate change is here and poses a very real threat to the development of our societies – we know with certainty that this and future generations will live in circumstances dictated by actions taken now. The effects do not respect national boundaries, reminding us that we are part of a global community that must work together to resolve the predicament brought on by two centuries of escalating atmospheric pollution.

Some global leaders have dithered over this issue, while a number of corporate and political voices have downplayed its severity until recently. We now find ourselves with no time to spare. The most recent research available tells us that the “carbon space” is finite. A total of 70% of this has already been used up – largely by developed countries. The dispensation for equitably sharing the remaining 30% of the available “safe” carbon space must recognise historical responsibility for the problem, and the growth imperatives and development aspirations of developing countries.

Climate change with inadequate action would mean a world with increasing flooding, drought, heatwaves, famine and disease. Human suffering, worsening poverty,



and even political and economic instability would affect all global citizens. These effects would be exacerbated in South Africa and the rest of Africa, where many people live in informal settlements, on subsistence agricultural land and on the edge of the formal economy. The changes would certainly harm most those who are least able to adapt and least able to afford the impacts. The wealthy no longer have the luxury of closing their minds to the devastating impact of what is happening in the fragile atmosphere that envelops our planet.

We all therefore have a moral obligation to act now to prevent this climate crisis from becoming unmanageable. The science is clear. Global emissions must peak and decline within the next 10 to 15 years. In order to achieve this, each and every one of us will have to make a contribution.

As formidable as the climate crisis is, it presents us with a tremendous opportunity. It gives us the chance now to make a choice to live in greater harmony with our planet and to strive to create a more balanced society. Economic growth and development is not incompatible with ambitious climate policy. There are many opportunities in the emerging carbon-constrained economy to build new industries that turn our comparative advantages into competitive advantages, to create new jobs and new incomes. I encourage South Africans to read this book and to take its recommendations to heart, as its pages are bursting with suggestions about how we can overcome this problem as part of a pro-growth, pro-jobs and pro-development climate policy.

Our government has already committed to putting in place fiscal, regulatory and legislative policies and measures that will pave the way towards a low-carbon economy and society. Corporations must transform their practices and build new climate-friendly industries. Individuals must reduce their carbon footprints and lobby for change.

I appeal to all of you to assist us in our efforts to reduce the emissions caused by ceaseless consumption, flying, driving and use of inefficient electrical appliances. Let us also ensure that we take responsibility for the members of our society who are least to blame for this problem and are ill-equipped to cope with the impending changes – they are the innocent bystanders.

Let us work towards the greater good of all global citizens and our planet.

*Marthinus van Schalkwyk*

July 2008



*Humanity must act collectively and urgently to change course through leadership at all levels of society. There is no more time for delay.*

United Nations Foundation on confronting climate change

# Introduction

Robert Ziplies

Humanity is gradually awakening to the climate crisis and is starting to take action. However there is little time to spare, and all of us must contribute to this effort. This book explores what we as South Africans, irrespective of our roles in society, need to do about climate change.

Chapters 2 to 6 provide a comprehensive overview of the crisis and include a description of the latest research findings regarding our state of the environment and climate change. This is followed by a review of the broader socio-economic implications and a reflection of what we have done to bring about this crisis.

From here we move on to describe how each of us can become part of the solution, what actions we need to take as a society to prepare for and tackle climate change, what emissions South Africa is responsible for and what national mitigation efforts are required in the energy sector. The remaining chapters then explore the actions that need to be taken by specific sectors of society and with respect to particular issues such as transport and waste. Chapters each begin with a short abstract and end with a “Resources” list of recommended further reading.

In South Africa, when a new dinner-table topic successfully competes with discussions of crime, corruption, soccer and rugby, we know it is important. 2007 is notable for being the year in which the issue of climate change went mainstream, and we have seen a fast progression in the nature of discussions from “what is it about?” and “are we really the cause?” to the all-important “what do we need to do about it?”

Globally, society has at last reached a stage where it is gradually moving from deliberation to action. In 2007, even the US recommitted to international efforts to reduce emissions, and there is now regular news of major corporations upping their commitment to tackle climate change. While the rich nations have caused the bulk of the problem, major developing nations with high emissions – particularly Brazil, India, China and South Africa – must now also contribute to reducing their outputs. South Africa has undertaken to contribute its fair share. Trevor Manuel’s 2008 budget speech was the first that took cognisance of the need to build sustainability thinking into our economy when he talked about issues such as energy efficiency, responsible use of our natural resources and the fact that we cannot sustain economic growth using the same principles and technologies as we have in the past.

*We have a very small number of years left to fail or to succeed in providing a sustainable future to our species.*

*Jacques Cousteau*

There is a growing recognition that our wellbeing as humans and the vitality of our economies are entirely dependent on a healthy environment. Just a few degrees separate us from a world of far greater weather extremes in the form of vicious storms, terrible flooding and cruel droughts. Ecosystems would not be able to support the density and diversity of plant and animal life we see now. The result? A drastic and traumatic decrease in human population numbers in what James Lovelock refers to as a global “cull”. This world would be a harsh world to leave to our children. A cooler Earth, as we still have it, makes for a healthier and more hospitable home.

For several generations, we have been conducting a foolhardy global experiment with the only biosphere we have, and this tinkering has now progressed to dangerous levels. You and I, with our insatiable desire to burn greenhouse gas-emitting fossil fuels, plough the lands and cut down forests, are the undisputed cause. While cyclical climate change is a naturally occurring phenomenon, our anthropogenic emissions are boosting the Earth’s warming effect to perilous levels and, as a result, are pushing this delicately balanced natural system into an unstable state.

Climate change is unequivocal and very serious, and constitutes a *global emergency*. It is an 11th-hour crisis we can barely feel or fathom yet. The good news is that the science states that if we decide to take bold action quickly, the most severe

consequences of global warming can be avoided, and at a cost that need not significantly inhibit economic development. The bad news is that our existing and planned international efforts are not ambitious enough – there is an unacceptable gap between what is required by science and the actions being taken by global society. If we don’t close this gap, we will fail.

We have no choice but to succeed. All of us are compelled to ramp up our efforts dramatically and learn to live in harmony with nature. In this undertaking, we must all recognise our role, each according to our individual and organisational abilities and sphere of influence. And as an energy-hungry society, South Africans have a weighty obligation to mitigate their emissions. Government is responsible for creating policies that encourage a low-carbon economy and allow us to continue to create a more equitable society. Business must find ways to minimise environmental impacts caused by producing and delivering the products and services that we consume. We as individuals are obligated to drive the change in government and business, while each of us – particularly those who are middle- to upper-income earners – strives to reduce our personal consumption levels.

The climate crisis challenges virtually everything we do. We give it little thought when we get water from a tap, brush our teeth, switch on the lights, drive or fly somewhere, and purchase food, products or services. Yet all these activities are dependent on our all-pervasive use of coal, oil and gas and other unsustainable practices. The causes of the problem are deeply embedded in the structures of our economy, society and individual behaviour. Successfully tackling climate change will require a fundamental rethink of how we live our lives. Not only will it necessitate exceptional levels of national and international cooperation, but it will also demand unprecedented levels of commitment from you personally.

We all have a stake in this issue and, as consumers, parents, voters, citizens, employers and employees, we have an obligation to ensure that we make an expedient and just transition to a more sustainable society. This is a situation that requires “all hands on deck”.

*Few will have the greatness to bend history itself; but each of us can work to change a small portion of events, and in the total of all those acts will be written the history of this generation.*

*Robert F. Kennedy*

This book, which contains contributions from numerous experts in many disciplines, explores the details of the problem and what we as individuals and a society must do to tackle climate change. Chapters 2 to 6 describe *the crisis* in which we find ourselves. We investigate why a healthy environment is the bedrock of our social, economic and personal wellbeing, before exploring the overall state of our

environment. Then we describe the climate crisis, arguably the most pressing of many environmental issues, and the latest research findings as they relate to South Africa. This is followed by a discussion of possible social and economic repercussions. In *Chapter 6* we review how we got into this mess and end on an upbeat note, describing a possible vision of a more sustainable future.

The remainder of the book focuses on what we need to do to *tackle climate change*. In *Chapter 7*, we consider some of the behavioural issues that must be identified and confronted. Then we describe some overarching strategies for tackling climate change, and move on to investigate the source and nature of South Africa's emissions, before exploring the emission-mitigation options open to us as a nation. *Chapters 11* and onwards explore possible solutions for specific themes and sectors of society, such as you at home, government, the business sector, investors, farmers, civil society, property developers, urban planners, transport, waste and education.

You will note that some chapters are targeted at very specific audiences. I recommend that to obtain a good overview of the most important issues, you read all chapters up to and including *Chapter 11: Your government, our government*, and then dip into the remaining chapters as they are of interest to you. On a cautionary note, you will find that some of the initial chapters are packed with bad news, which may lead to despair and an urge to stick your head in the sand. But bear in mind that there is no better antidote for this state than to roll up your sleeves and get stuck in. This book is bursting with solutions and taking action is guaranteed to help raise your levels of optimism.

While each chapter could constitute a book in itself, collectively they aim to offer a succinct and practical overview of the major issues. Abstracts provide you with a quick overview of the chapter content and "Resources" lists at the end of chapters indicate suggestions for further reading. Key facts are referenced throughout and a references chapter is included at the back of the book. While a few chapters are necessarily more technical, you will find most of them to be easy reads. Where you are left with questions, I can recommend the Internet-based Wikipedia as a great information resource to assist with unknown terminology and concepts.

Please be aware that with so many co-authors – unless one has an overabundance of time for editing – there is some unavoidable overlap in information, a few minor variations in opinion and differences in writing styles. In isolated instances you may notice some discrepancies in data, which does not mean one of the sets is wrong. Data – particularly about greenhouse gas emissions – can vary, depending on when it was compiled, what emission sources are included (e.g. only fossil-fuel emissions or also emissions from deforestation and other sources) and how it is stated (e.g. as CO<sub>2</sub>, an equivalent amount of CO<sub>2</sub> or as a carbon equivalent).

This book has been sponsored by a number of corporations – funding without which it could not have happened – and there is sometimes the impression that such publications pander to specific wishes or objectives of their sponsors. I can assure

you that this has not been the case here and we have maintained absolute editorial independence. It must also be said that the purpose of this book is not in any way to put blame on any particular institutions or industry sectors, but to state the facts and describe what needs to be done. We are all part of the problem and we all rely on power utilities, industry and business to supply us with electricity, liquid fuels and the myriad other products and services that we consume on a daily basis. Together we must find the solutions and support those that are the most proactive.

It was just over 25 years ago – I was a teenager – that I first learnt about global warming. My uncle, then a science journalist, explained how burning fossil fuels and deforestation were exacerbating the Earth's natural greenhouse effect, with potentially serious consequences for humanity. This discussion caused me to despair about our future for a while, but, quite naïvely, I felt secure in the knowledge that adults would solve this problem by the time I had grown up. Not a chance! Aghast, I have witnessed the scale of the problem becoming infinitely worse. Now, there is no time to wait for another generation to take action.

Recently I talked to someone whose teenage daughter experiences deep despair and anxiety about climate change. I can't help but wonder how many other young people today worry deeply about the issue and their future. I hope they are not being naïve in their faith that we can successfully tackle the problem. Let us not disappoint the next generation.

“How wonderful it is that nobody need wait a single moment before starting to improve the world.”  
Anne Frank

During times of emergencies, humans are known to put aside their petty political and ideological differences and pursuit of self-interest for the benefit of everyone. This is such a time. Climate change provides us with a common cause and is as much about confronting our personal gremlins of self-interest and short-sighted profiteering, as it is about taking united and just action. We are witnessing a gathering groundswell as millions of people around the world are starting to adapt their personal habits and contribute to institutional change. The speed and success of our efforts to bend the curve on our emissions will determine what kind of planet our children will inherit. I deeply and urgently hope that you too will become an agent for change as we belatedly but inexorably move into the environmental age and begin creating a better future for all. Take action now to help bend the curve.