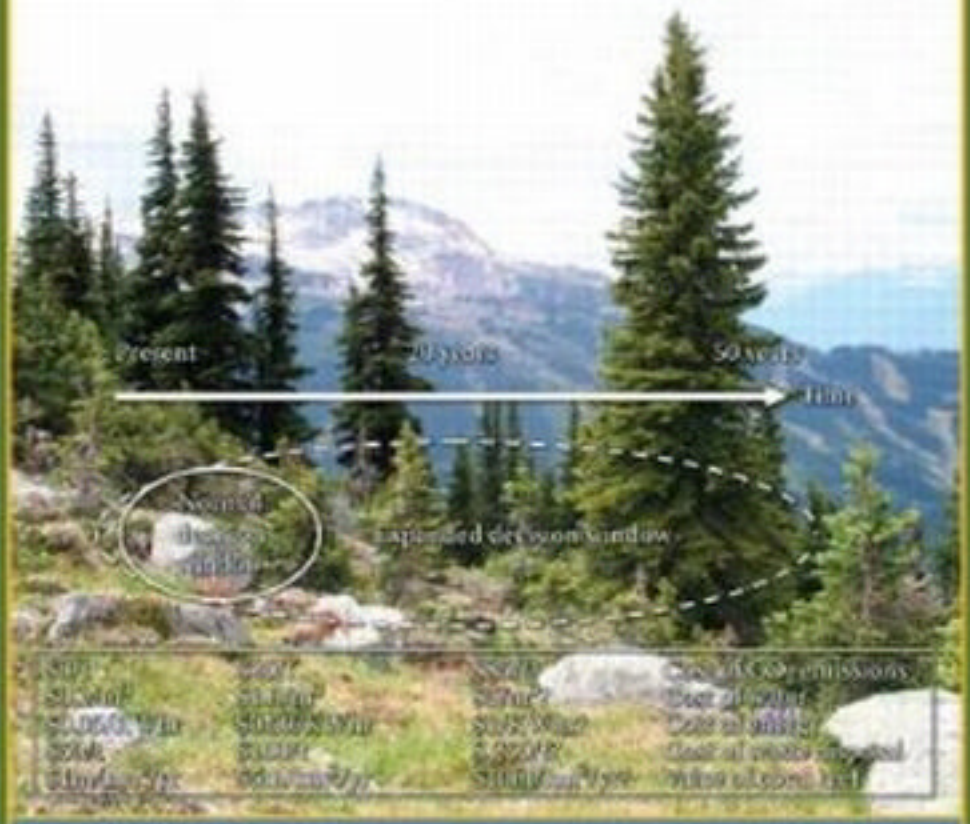
Environmental and Economic Sustainability



Paul E. Hardisty

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Environmental and Economic Sustainability

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Dedication

To the mentors in my life: Dad, Fred, Tad, and Peter. Thanks for your wisdom, guidance, criticism, and support.

Contents

Foreword

Until relatively recently, serious discussion of environmental issues at board level was the preserve of an enlightened few companies. For most, protection of the environment was considered to be only a legal compliance issue. However, recognition of the magnitude and severity of human impact on the global climate, coupled with society's demand for greater corporate social responsibility, has changed all that. Whilst climate change has dominated the environmental agenda in recent years, there is a growing awareness that preservation of the wider environment, dwindling resources and social well-being demand an integrated approach if future generations are to prosper.

Whilst this is a great philosophical conclusion to reach, we live in a world where the common global language is money. Hardisty's book shows us how to use the language of money to make decisions that are right for the environment, society, and, critically, the commercial world that we rely upon to increase our quality of life. This does not mean that we are being encouraged to somehow "sell out" the environment, but rather that by measuring and internalizing the value of the environment and resources to society, we will make decisions that are more sustainable for all.

Dr. Steve Wallace
Head of Climate Change and Environment
National Grid

Preface

At the United Nations Copenhagen Climate Conference in December 2009, I had the opportunity to meet with a senior scientist from the U.S. National Oceanographic and Atmospheric Administration (NOAA) in the U.S. pavilion. He was playing with a remote control device that was directing the data feed to four high-definition projectors aimed at a massive translucent sphere hanging from the ceiling. The sphere, of course, was Earth. He brought up satellite and radar imaging data on Arctic sea ice for every day going back several years and then let it run. We watched the sea ice go through its yearly cycle of winter expansion and summer contraction. He stopped the run at mid-September 2009 and described what we could see: an ice pack that was at its third smallest areal extent ever (2007 was the lowest; it dropped 35% below the long-term average in one year, with a slight recovery in 2008). Then, he explained the significance of the vast gray areas clearly visible against the white ice. "These are areas of thinning ice," he said. He went on to explain that the overall volume of Arctic ice is now less than one-third of what it was in the 1970s, and that 2009 was the lowest ever on record (so far).

The data are coming in quickly now. The World Meteorological Organization reported that the decade ending in 2009 was the warmest ever on record, and that each successive decade has been warmer than the last. The year 2009 was the fifth warmest on record. Twelve of the warmest years on record have occurred in the last 12 years. The natural climate has always been variable, but now the human-induced overprinting is becoming more and more dominant. And yet, our emissions continue to accelerate.

Climate change is not the only issue facing us in the twenty-first century. Water scarcity, the urgent need to produce more food for the billions we will add to the world's population over the next 40 years, the increasing disparity between rich and poor, the unraveling of many of the world's ecosystems, species loss, and the plight of the oceans are all equally deserving of our attention. We need to find and implement solutions to all of these (and other) challenges, and do it quickly, or face a perilous future.

Many of the fixes, particularly to global issues like climate change, may at first appear to be global in scale, solved only by international treaties and national policy. But, the combined effect of the millions of smaller-scale project and policy decisions made every day by businesses, industry, and organizations of all kinds is what makes global trends. At this smaller scale, a move toward more environmentally, socially, and economically sustainable choices, options, and policies can have a powerful effect.

This book, the result of over 15 years of research and practice, introduces the environmental and economic sustainability assessment (EESA), a process that helps decision makers at all levels balance the needs of society, the environment, and business over the long term by quantifying sustainability in a way that is physically based and objective. Ultimately, this book is about communication: including stakeholders

in a transparent process that provides a robust view of how various options compare over a wide range of possible future conditions using a language that everyone understands—money.

In Copenhagen, the real climate change debate was mostly about money: who is going to pay and how much, how developing countries can access financing. Although everyone understands that we must act, they also realize that nothing can be done without funding—simply because money is how we measure *value* (whether we like it or not). Ultimately, the solutions to the problems of the twenty-first century will come from understanding and acknowledging the tremendous value that the environment provides, and reflecting that value within decision making at every level so that *society as a whole* is better off from each choice we make. Perhaps it will be the sum of all of those beneficial decisions, taken every day, at every level, that will help to change the world.

Paul E. Hardisty

About the Author

Paul E. Hardisty is executive director, Sustainability and EcoNomics™ for WorleyParsons, one of the world's largest engineering companies. For over twenty years, he has been advising industry and governments around the world on environmental strategy and sustainability. He is a visiting professor in environmental engineering at Imperial College, London, and adjunct professor at the University of Western Australia School of Business, where he teaches sustainability and climate change to MBA students. Paul is the author of numerous technical papers, books, and newspaper articles on environmental issues and a soon-to-be-released novel, which he describes as an eco-thriller. He is a contributor to President Gorbachev's Climate Change Task Force, a member of the Waste Management Authority of Western Australia, and a director of Green Cross Australia. Paul lives in Western Australia with his wife, Heidi, and two sons, Zachary and Declan, and for fun competes in Ironman triathlons.

1 Introduction

THE EXPONENTIAL ERA

In the twenty-first century, the world is a place of unrelenting and ever-accelerating change. Financial turmoil sends the global economy from the heights of boom to unprecedented depression in a few short months; the price of oil skyrockets to over five times its previous long-term average and then tumbles down again in a matter of weeks (Figure 1.1); after taking a hundred thousand years to reach just over 6 billion, the world's population will grow by almost 4 billion in the next 40 years[1] (Figure 1.2); the extent of arctic sea ice, in steady decline since the middle of the last century, falls off alarmingly in 2007 and 2008;[2] emissions of greenhouse gases (GHGs) to the atmosphere are rising faster than ever before.[3]

We live in the exponential era—a time unique in history, when a confluence of overlapping and mutually reinforcing factors is propelling the world into unknown economic, social, and environmental territory at an accelerating rate.[4] Not only are there ever more people on the planet,[5] but quickening development, particularly in India and China, means that each of these people is demanding more of the world's resources. Technology spurs development, and our exploding technological prowess allows us to wield greater power over our environment and surroundings than ever before. A single man with a D8 caterpillar can now clear as much land in a day as his grandfather could have in a decade of hard manual labor. Our ability to assimilate, use, and process data and information is exploding, just as predicted by Gordon Moore, the founder of Intel. In the 1960s, he predicted that the number of transistors on a silicon chip would double every 18 months—and it has, inexorably, since then.[6] But, a rapidly rising global population, combined with accelerating development and resource use, surging energy demand, and an ever-expanding need for water and food, is also creating huge stress on the natural environment. This combination of forces, which some are now calling simply *global change*, is leading to chronic overfishing, large-scale clearing of native forest, an alarming and accelerating loss of global biodiversity, and increasingly stronger evidence of the impacts of climate change.[7] Many are now calling this a time of unprecedented global environmental crisis.[8]

CRISIS—WHICH CRISIS?

But other issues, equally worthy of the dubious distinction "crisis," abound. Poverty remains a blight on humanity. Today, according to the most recent statistics from the United Nations, approximately 45% of the world's population lives on less than US$1 per day.[9] In the United States or Europe, that much would not buy one decent meal. An astonishing 65% of the world lives on less than US$2 per day. And, the

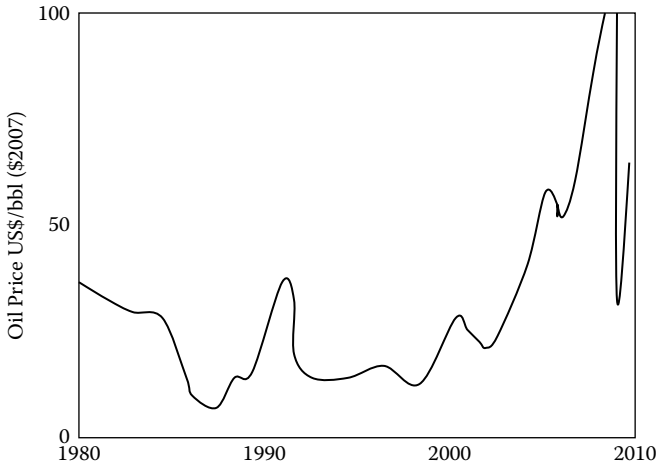

FIGURE 1.1 Actual oil price in U.S. dollars per barrel, 1975–2009, with 2% and 5% increase trend lines from 1988.

numbers of chronically poor are increasing despite the efforts of well-intentioned organizations and individuals around the world. But, the disparity in income is not the only measure of poverty. Never before in modern history has wealth been more concentrated in fewer hands: The richest 1% of the people on the planet control about half of the wealth. The poorest half of the population, over 3 billion people, owns less than 1% of the planet's wealth. This shocking inequality is also growing, accelerating in the wrong direction (20 years ago the top 1% controlled about a quarter of the wealth). Poverty can also be measured in other ways. Over 1 billion people on the planet lack access to safe, clean drinking water, and that number is rising. Lacking this most fundamental of goods, these people are *water poor*, and it affects every

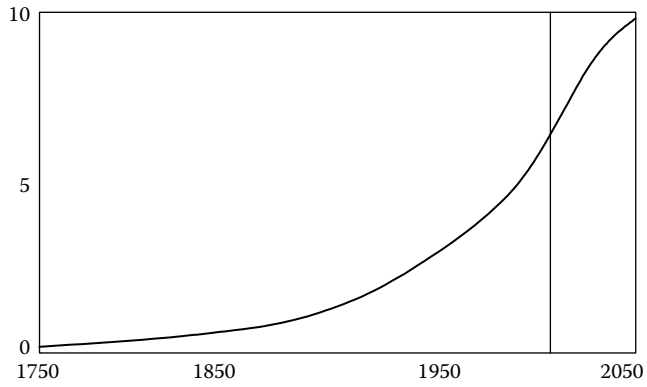

FIGURE 1.2 World population growth 1750–2050 based on data from U.N. Population Project and Cohen (1995).

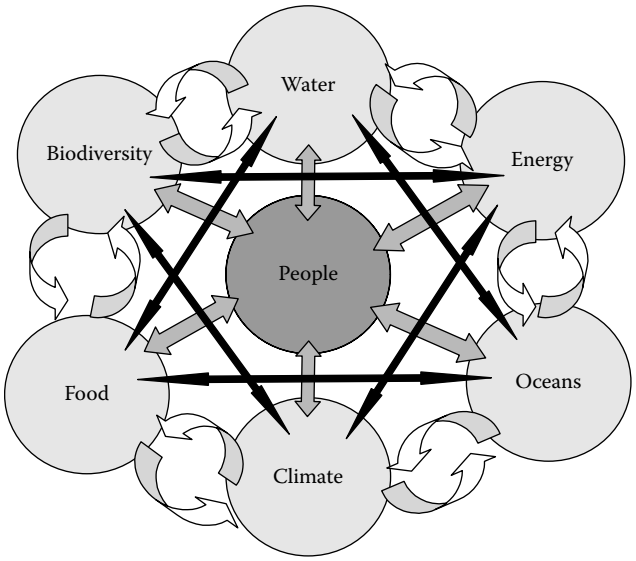

FIGURE 1.3 An interconnected world: humankind's all-affecting role on the planet.

part of their lives. These are all examples of increasingly unsustainable trends—they cannot continue indefinitely, as history has shown, without causing major ruptures in society.

All Feeding Off Each Other

Many, if not most, of these crises are actually interlinked, interdependent, and mutually reinforcing. Figure 1.3 provides a basic schematic overview of the causative and consequential links between people and the world we inhabit. The interdependence is startling. An economic paradigm that focuses on gross domestic product (GDP) and does not explicitly account for the value of external issues (environment, society, depletion of natural capital) accelerates the use of natural resources of all kinds and concentrates wealth; concentration of economic wealth and income disparity create poverty; poverty causes environmental degradation as people are forced to destroy natural capital just to survive; environmental degradation further reinforces the poverty cycle as the land is degraded; and pollution leads to health impacts, further loss of income-generating potential, damage to the means of livelihood, and eventually social strife. Civil unrest among the disaffected and displaced leads to the rise of extremism and terrorism. And as the population grows, and each of these issues develops more rapidly, the need for solutions becomes even more urgent.[10]

Cheap Energy, Climate Change, and Poverty

The widespread availability of "cheap" fossil energy has driven global economic growth, creating prosperity for many (but not most), but as a consequence has laden the atmosphere with billion of tonnes of GHGs, which are accelerating the natural

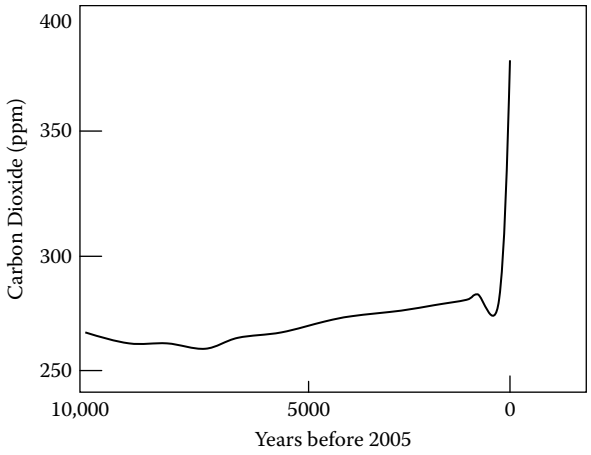

FIGURE 1.4 Atmospheric concentrations of CO_2 over the last 10,000 years (based on data from the Intergovernmental Panel on Climate Change, Fourth Assessment Report: The Physical Science Basics, 2007, Cambridge University Press, Cambridge, UK).

changes in the Earth's climate (Figure 1.4). Climate change is, among other things, essentially a story of the redistribution of water, increasingly through extreme weather events.[11] That means, in very general terms, more flooding in areas that are already wet and more drought in areas that are already arid.[12] Flood or drought—both lead to hardship, loss of economic activity, declining agricultural production, and damage to property. Climate change is predicted to have a disproportionate effect on the poorest people of the world and so will only reinforce poverty and the wealth and income disparities between haves and have-nots.[13] Even our efforts to protect ourselves against climate change, if executed using current business-as-usual decision making and technology, will act to reinforce climate change. In Australia, for instance, chronic drought due to changing rainfall patterns triggered by climate change[14] has led to the building of new desalination plants, with more planned. If powered by electricity from a predominantly coal-fired grid, these plants will add more GHGs to the atmosphere, exacerbating climate change. These anthropogenic feedback loops will simply reinforce the problem in a descending spiral. The harsher the impacts of climate change, the more energy we will need to protect ourselves and adapt, the worse climate change will get. One of the most pressing questions facing people and governments around the world today is: Which of these simultaneous crises do we deal with, and how?

A Crisis of Sustainability

These, and other issues such as the threat of terrorism, nuclear proliferation, AIDS, pandemics, and basic food security, are all essentially *crises of sustainability*—they cannot go on indefinitely. Societies, ecosystems, countries, sectors, industries, people—all are locked together on the same planet, subject to the same laws of physics and biology. One way or another, unsustainable behavior will eventually lead to

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