PLAN A:

A SHORT GUIDE TO A SECURE FUTURE

BY

STEPHEN STRETTON

CAMBRIDGE, UK

MARCH 2010

The book (latest version) is available online at http://www.stephenstretton.org.uk

The author welcomes comments and feedback using the email address below.

stephen@stephenstretton.org.uk

OVERVIEW

Introduction

The purpose of the book is introduced and an executive summary is given of the main conclusions and policy recommendations.

Part 1: Science and the “Triple Crisis”

Part One sets out some key economic, energy and environmental problems facing the world. The science of climate change and the climate targets needed to avoid dangerous climate change are outlined.

Part 2: Engineering a Zero Carbon Future

Part Two sets out a plan for decarbonizing a specific economy, that of the UK. Issues regarding technology choice are discussed.

Part 3: Economics and Carbon Pricing

Part Three sets out the economics of taxation and scarcity.

Part 4: Politics and International Policy

Part Four sets out the game theory of tackling climate change and energy security, including ways to overcome the 'tragedy of the commons'.

Part 5: Financing the Future

Part Five deals with macroeconomics, banking and the finance of energy infrastructure.

ACKNOWLEDGMENTS

I'd like to express my thanks and gratitude to Elizabeth Cary for proofreading and for many helpful suggestions.

I'm also grateful for conversations with: Terry Barker, Robin Hankin, Annela Anger, Martin Sewell, Mark Syddall, Athanasios Dagoumas, Serban Scrieciu, Svetlana Tashchilova, Katie Jenkins, Ramona Meyricke, Scott Kelly; Doug Crawford-Brown, Jonathan Hollander, Tim Joslin; Pablo Candela-Pokorna, Beth Wattleworth, Shuo Zhang; David Mackay, Jasper Sky; Lord Nicholas Stern, Alex Bowen; Robin Smith, Adrian Wrigley, Neale Upstone; Cathy Kunkel, Mechthild von Knobelsdorff, Marc Kaufmann, Stephen Rowley, Gunnar Möller; Anna Stephenson; Qian Cheng, Dirk Heine; Andrew, Kate, Susan and Peter Stretton; Pat & Jack Cousins; Grace Collord; David and Evelyn Wasdell; Christine Zumkeller; David Howarth; Richard Starkey; Steven Stoft; Oliver Tickell; Paul Lavelle; Hannah Smith, Sanjay Manohar, Dan O'Neil, John Turville, Melanie Palmer, Emily, Lorna, & Ian Cool; Geoff & Josie Wexler; Philip & Elizabeth Slater; Philip Sargent, Tim Jervis; Melanie Strickland; Dave Hampton; Tatiana Vakhitova; Rich Hawkins and Tim Helweg-Larsen; Christine Urbanski; and others.

ABOUT THIS BOOK[1]

Welcome to *Plan A: A Short Guide to a Secure Future*. This is a transdisciplinary guide to tackling climate change and interconnected problems, in a politically and technologically realistic manner.

Summary of The Book

This book deals with three major sets of global problems: economic, energy, and environmental; focussing specifically on the problems associated with human emissions of greenhouse gases, such as global climate change.

Generally, I argue for two design principles for successful solution to these problems:

- Do *enough* to solve the climate change problem
- Do it in a way that has *positive value* to individuals, companies and nation states

These principles have the following practical expression

- *Reducing* carbon emissions is not enough; we need a *zero carbon economy* as quickly as possible.
- *Saying yes: we* need all the ultra-low carbon technologies available to us, including renewable, nuclear and carbon capture electricity.
- We need a *politically realistic* approach, which takes account not only of the interests of individuals, companies and nation-states as *economic agents* but also as *political agents*.

A set of policy responses to those crises are put forward:

1. "The Energy Refund for the Climate Cub": A *carbon tax of $100-200/tCO$_2$, imposed by a club of nations, and with the revenues refunded so that no major group is worse off*.
2. *"Energy Price, Carbon Price, and Energy Tax Guarantees": financial guarantees of minimum carbon prices for investors in low-carbon power and energy efficiency*: Developments of already existing proposals created to encourage investment and make credible commitments to reduce greenhouse gas emissions. These guarantees attempt to be what might be termed 'universal positive incentives', in other words, financial means of encouraging a desired course of action that provide only benefits to agents relative to the status quo but which are complete and economically efficient.
3. "The Good Investment Bank": *and a new international bank to fund investment to decarbonize the world economy over the course of the next twenty years.* This proposal is likely to get the economy going again and stimulate investment in clean technologies.

---

1 Author: Stephen Stretton <stephen@stephenstretton.org.uk> Last Updated: 10th March 2010

Treatment

This book is intended to be scientifically rigorous and well structured. In this way it is hoped that some of the chapters may be suitable for peer-reviewed journals such as *Energy Policy*. In order to ensure that each chapter is ready and suitable for such a form, the language used must be scientific in style. The first two chapters are a little different. Chapter one is the introduction, and summarizes the whole book. Chapter two is a summary of climate science and is more broad than is normal for a scientific paper.

Intended Audience

It is important that the book is pitched at a consistent level. This book is intended for researchers in this interdisciplinary field, and the intelligent layman who *thinks for him/herself*, and is *critical* about what he hears. In general this book is intended to tell the simplest story that is reasonably complete about tackling the global triple crisis. The book outlines the key conceptual features of the situation as required by the policy maker or active citizen. No more detail is given than is needed from the point of view of *what we should do* at the same time as having in mind, in broad terms, *how the (Earth) system works*.

Market

The book could engage the public in a similar way that David Mackay's book did. It could also be a textbook of Environmental policy for environmental sciences courses.

Chapters

The book is split into chapters, which are available separately. Each chapter has an 'executive summary', which summarizes the main points; and a statement of those arguments or conclusions which may be novel or not widely known. Most chapters also have a conclusion and are followed by a list of references.

Language Conventions & Equations

The language used is intended to be plain but precise. This book is written in plain British/international English. Spelling conventions in general conform to British English. Words ending in '-ise'/'-ize', are spelt ('-ize')[2]. Mathematical representations will be used where necessary: physics will be described with equations and approximate numbers.

Format

This document is originally written in *Open Office Writer*, using the native open document (.odt) format. I use *footnotes* (as opposed to *endnotes*) throughout the text. This is then published using portable document format (.pdf). Source files are available on request.[3]

---

2 Note that, contrary to popular belief, '-ize' is an acceptable option in British English, as well as being standard US usage and is close to the original root. '-ise' is acceptable only in British English.

3 Open office is available free from http://www.openoffice.org and Adobe Reader from http://www.adobe.com.

For references I use *Zotero.* The referencing style is '*Harvard Reference Style format-1 (Author-Date)',* and I use OpenOffice 'reference marks', which can be saved in *.odt* format and are not compatible with Microsoft Word[4].

Companion Spreadsheets

Most of the chapters are illustrated with spreadsheets which either set out the calculations in the chapters, or contain a simplified mathematical description of the model in question. Throughout the book, I aim to give clear numbers to justify the points made.

Communication & Marketing

Along with this book, I propose a comprehensive communications strategy to put across the ideas in the book. This includes

- I propose to present each section of my work, with power point presentation[5]
- Recording these seminars and placing them on YouTube

In these communications, I will make use of the *pyramid of information.*

Word>Phrase>Sentence>Elevator Pitch

Title>Abstract>Briefing Sheet>Scientific Paper

Icon>Picture>Graph>Table

Publisher

I intend to approach the publishers of David Mackay's book, UIT Cambridge (http://www.uit.co.uk) as my first port of call.

Black and White or Colour?

My book is mostly in black and white, and so this could be consistently published as such. A black and white book will cost around 1 pound a copy to print; colour would cost more. Black and white is also more economical for short print runs.

Next Step: Generate a 'blurb'

This section will be developed into a 'blurb'. This will include:

- A introduction to the topic addressed
- A treatment - how you are going to treat the subject
- An indication of the market and any competition
- A detailed table of contents

4 Zotero is available free from http://www.zotero.org . All of my references are available online.
5 I could possibly translate each presentation into a box, similar to the Stern review.

Executive Summary

The scientific conclusions and policy recommendations of the book are summarised. This book deals with three major sets of global problems: economic, energy, and environmental; focussing specifically on the problems associated with human emissions of greenhouse gases, such as global climate change. A set of policy responses to those crises are put forward: a carbon tax of $100-200/tCO2, imposed by a club of nations and with the revenues refunded so that no major group is worse off; financial guarantees of minimum carbon prices for investors in low-carbon power and energy efficiency; and a new bank to fund investment to decarbonize the world economy over the course of the next 20 years.

PLAN A: A SHORT GUIDE TO A SECURE FUTURE – *EXECUTIVE SUMMARY*[6]

The Triple Crisis

- There are serious global problems related to our economy, our future energy supply, and our environment. Realistic solutions to these problems exist (see below). Well-designed policy changes can mitigate these problems and create long-term benefits; but we need to consider solutions that take into account the interests and behaviour of individuals, corporations and nation-states, both as *economic* and *political* agents. This book sets out a set of policies for an integrated approach to our economic, energy and environmental (E3) problems (Chapter 1).

Energy and the Environment

- The global temperature responds (with delay) to atmospheric concentrations of Carbon Dioxide (CO_2) and other greenhouse gases (GHGs). These concentrations are already much higher than they were before the industrial revolution; every year mankind adds more greenhouse gases to the atmosphere through the burning of fossil fuels and other activities. To avoid a *high risk* of irreversible or catastrophic global warming, *concentrations* of GHGs in the atmosphere must be stabilized at close to or below current levels (Chapter 2).
- To stabilize GHG concentrations requires that emissions be reduced to near zero. We need an economic and technological model with total emissions of less than 1 tonne of CO_2 equivalent per person per year, a ninety percent reduction in UK greenhouse gas emissions. Adopting such a model over 10-25 years would provide a positive example towards which the developing world can converge, stabilising GHG concentrations (Chapter 3).
- The focus of this book is the energy sector, which represents approximately 85% of UK GHG emissions and two thirds of global emissions. A largely carbon-free energy system is therefore necessary but not sufficient for climate stability. The new energy economy is *likely* to be based primarily on *electricity* generated using power sources such as renewable energy, nuclear fission, and carbon capture and storage. Carbon-free electricity can provide not only our *existing* electricity needs, also our *other energy requirements*, including *transport* (trains; electric cars) and *heating* (heat pumps) (www.withouthotair.com). Such an energy system can be achieved in 10-25 years with appropriate finance and market incentives. (Chapter 4-7)

---

6 Author: Stephen Stretton <stephen@stephenstretton.org.uk> Last Updated: 10th March 2010

Principles of a Solution

I will argue for two overarching design principles for solutions to these interlinked problems:

- Do enough, to solve the problems, in particular, do enough to stabilize the climate
- Do it in a way that is positive to individuals, companies and nation states.

What would be enough to protect the climate? Three major principles follow from the physics:

- Reducing carbon emissions is not enough; we need a zero carbon economy asap. (Chapter 3)
- 'Say yes' to the low carbon technologies available to us, including energy efficiency, renewable, nuclear and carbon capture electricity. (Chapters 4-7)
- Such changes need to be enforced by a price of carbon an order of magnitude higher than the current European emissions trading (ETS) price. That price should be upstream, cover all the sectors and include the carbon embodied in *imports* to any countries not covered by strong climate policy. (Chapters 8-9)

What would be positive for all actors? We need an approach that takes account not only of the interests of individuals, companies and nation-states as *economic agents* but also as *political agents* (Chapter 11). We need a *politically realism* not concerning *how much* or *how fast* we reduce emissions (we need to do what is *necessary for a secure future*) but instead concerning *how we achieve those reductions.* This means that we should have a 'no-worse off principle'. This has implications for international negotiations (Chapter 12-13), and the policies proposed.

"An Energy Refund for a Climate Club" (Chapter 14-15)

- I propose that a country, or a group of countries, impose a tax on the carbon content of fossil fuels of around \$100 - \$200/tCO_2. The revenues would be refunded to companies, individuals and resource owners within the club. In the short term, the revenue should be given back to individuals based on historical usage, in the long term, it should be used to eliminate VAT and corporation taxes.
- The tax could be coordinated internationally within a 'climate club' of nations interested in keeping the oil price low and preventing global warming.
- It is argued that this policy would have the following benefits:
    - A global environmental benefit from reduction in emissions & efficient use fuel.
    - A national benefit from the revenue raised from carbon tax can eliminate other taxes promoting equity and efficiency.
    - A benefit to oil importers since a reduction in oil consumption would reduce the global pre-tax price of fossil fuels, reducing import costs[7].

7 A reduced fossil fuel price (relative to a scenario without the proposed policy) provides a benefit for countries that are net importers of fossil fuels. By keeping the oil price low (e.g. below about \$40/bbl), the extraction of even more highly polluting fossil fuel alternatives, such as coal-to-liquids and tar sands, is prevented. It should be noted that a reduced world price for fossil fuels will *increase* demand for fossil fuels in areas not covered by a carbon price. This is an example of 'carbon leakage' and would take place with either carbon taxes and cap-and-trade schemes. If *all* countries are covered by carbon taxes or cap-and-trade schemes, however, there would be no leakage.

Government Carbon Price Guarantees (Chapters 16-18)

- Governments should encourage large-scale investment in low carbon energy and energy efficiency. This can be done by auction contracts guaranteeing the post tax electricity and carbon (tax + permit) prices, promoting sufficient investment to completely decarbonize the energy system. These guarantee that carbon prices will not in future fall, so providing certainty for investors.[8] Price guarantees may be useful too to implement international agreements to guarantee minimum carbon and post-tax fuel prices.

A Good Investment Bank (Chapter 19)

- International government should back a new bank, funded by bonds to finance investment in low-carbon technologies and finance a a massive programme of infrastructure investment. This would have the following benefits:
    - Improving our ability to generate energy domestically will reduce our future consumption of imported fossil fuels. This will improve our balance of trade and enhance energy security.
    - The investment needed to build the new infrastructure assets can be financed by national savings bonds which can also help fund the retirement of an ageing population.
    - Investing in infrastructure employs resources, reducing unemployment.

8 These guarantees attempt to be what might be termed 'universal positive incentives' – financial means of encouraging a desired course of action that provide only benefits to agents relative to the *status quo* but which are complete and economically efficient.