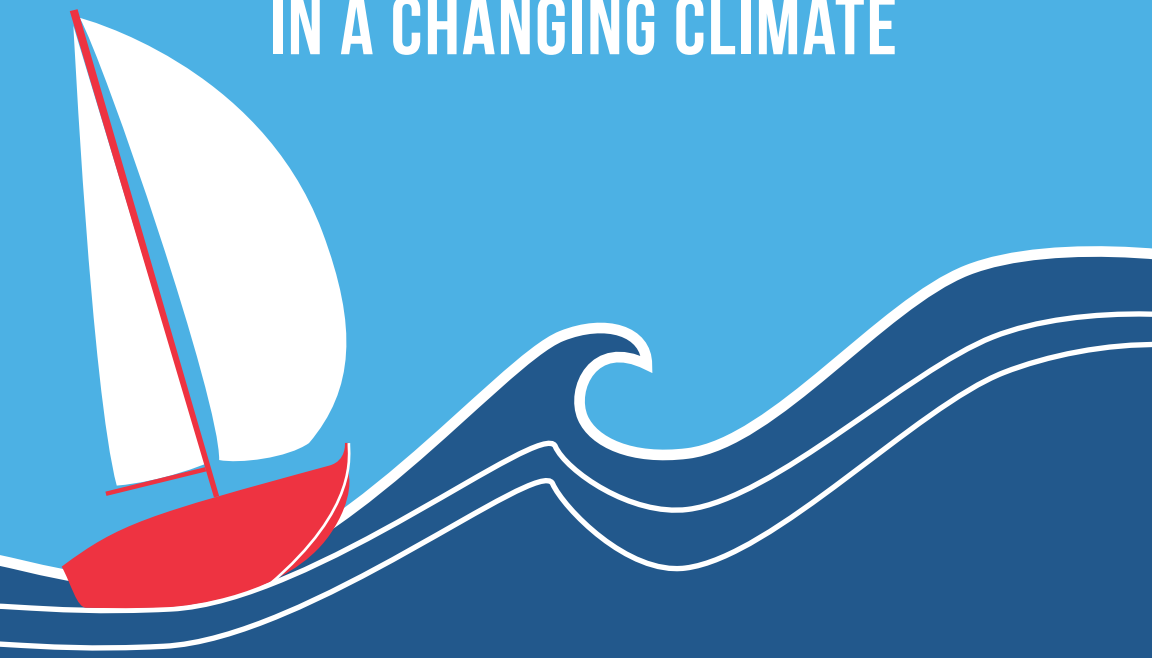
NAVIGATING THE ADAPTIVE ECONOMY

MANAGING BUSINESS RISK AND OPPORTUNITY IN A CHANGING CLIMATE



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The author does not specifically advocate any of the companies or business ideas presented in this book. In particular, it is not intended that the ideas herein necessarily represent environmentally sound options. People considering exploiting any of the potential products and services should undertake their own research and due diligence, including seeking independent, qualified advice as to how the various impacts of climate change, including the associated regulatory and societal responses might affect their business plans. The contents of this book do not constitute investment advice and no liability is taken for any loss or damage arising.

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Forward

The purpose of this book is to provide a tool kit for business owners and executives to shape strategic climate change action plans in ways that preserve and enhance business value while also delivering environmental benefits.

The subject matter is focused on the business opportunities and risks of adapting to a changing climate and the associated global response. It identifies a range of sectors whose products and services are either at risk or could benefit from these changes. It points out numerous areas where innovation will be needed to develop new products and services to meet changing needs.

This book is not about developing a corporate sustainability plan or making marginal energy efficiency improvements, though they are useful initiatives in their own right.

Now is our pivotal moment

This century, everything changes. The high speed growth trajectory the world has been on since the start of the industrial revolution is almost over. As our populations and environmental impact have multiplied, we now find ourselves occupying a planet that is straining to accommodate our insatiable appetite for food, water, energy, resources and things.

While technological innovation has allowed us to get away with this unsustainable resource consumption in the decades since we outstripped the earth's carrying capacity, we are facing increasing disruptive threats in the form of climate change, polluted air, water and soils, depleted fisheries, forests and other critical eco-systems.

Soon, within a handful of decades or less, everything must peak: peak fossil fuel dependence, peak population, peak pollution, peak per-capita consumption, peak greenhouse gas emissions. Otherwise – just as happens in nature and has happened before in human history – a population that grows and lives beyond its means faces collapse.

Declining fertility rates in developing and developed countries suggest that the global population will stabilise at about 10 billion around 2050. That reduction in demand growth will eventually have staggering impacts in economies that are built on the premise of continuous expansion. However, there will still be billions of people hoping to claw their way out of poverty and achieve the consumptive capacity of the middle class, meaning more food (including more complex, protein based foods), more energy and more stuff – from disposable nappies to handbags to TVs and tablets – will be demanded.

In many countries the average age of the population is increasing, with a massive demographic shift expected in the proportion of workers compared with retirees. This will also affect growth and spending patterns.

Meanwhile we have used our planet as a giant chemistry experiment, changing the composition of atmospheric gases, soils, fresh water systems and oceans in ways that are now material, and with effects that we are only starting to understand. This is repeated in the way we have upset the balance of many ecosystems and made thousands of species extinct through land clearing, wetland draining and poorly managed use of herbicides and pesticides. Millions of years of evolution creating complex food chains and biological balancing systems has been upset in just the last few decades.

In short, the twenty first century is going to be marked by a confluence of changes that will challenge the way of life we are used to. While this book's focus is on the impacts of climate change and how these can be harnessed by companies to reduce risk and create competitive advantage, it is set against the broader background of humanity's influence on its environment and associated demographic, social and technological mega trends.

Introduction
The Debate Is Over

In May 2014, comedian John Oliver, host of HBO's "Last Week Tonight" news satire, demonstrated comprehensively why there is no longer any need for debate about whether climate change is happening (it is), or what's causing it (mostly human activities).[i]

In the clip he starts off by showing a typical climate debate organised by a news or current affairs show, in which a lone scientist is pitted against a climate change denier. In this setting it's all too easy for the scientist to be drowned out by often slick-talking deniers with cherry-picked facts, pseudo-science, sustained attacks on the veracity of key United Nations IPCC[1] findings, or assertions of a conspiracy to undermine our way of life and "send us all back to the Stone Age".

Then Oliver resets the scene and demonstrates how lop-sided that type of debate is, by bringing 97 climate scientists onto the set, surrounding an uncomfortable group of three denialists. While in this case the majority of participants were members of the studio audience dressed in lab coats, the point that deniers are a very, very small minority is well made.

Across several studies including surveys and literature reviews, over 90% of climate scientists[2] agree, with extremely high confidence levels, that human activity is warming the planet.[ii] They agree this warming is being caused predominantly by the burning of fossil fuels (coal, oil and gas) and changes in land use (deforestation and other land clearing). And they agree that the consequences of this warming, even for current generations, could be pretty dire. As Oxford-based researcher Stephen Emmott wrote recently in language uncharacteristically hyperbolic for the scientific community: "personally, I think we're f****d".[iii]

1 The United Nations Intergovernmental Panel on Climate Change

2 and depending on the particular study as many as 97%

The UN IPCC is the peak global scientific body regarding climate change, along with the World Meteorological Organization (WMO). Every five to seven years it produces a major report that collates published, peer-reviewed research from thousands of climate scientists and synthesises the data to produce a massive three volume report. Each of the statements and predictions the IPCC makes is caveated in terms of the strength of the available evidence and the estimated probability of it being correct, based on rigorous scientific analysis. Its 2014 summary states that "...warming of the atmosphere and ocean systems is unequivocal" – a particularly strong statement for scientists.

It goes on to say that "…it is extremely likely that human influence has been the dominant cause of observed warming since 1950…"[iv]

So why aren't we rushing to do something about it?

Surely, if the evidence is clear that humans are responsible we can change our behaviours and fix the problem, right? After all, human beings are the most adaptable species on the planet and have survived and thrived in all corners of the globe.

Unfortunately, it's a little bit harder than that, for a number of reasons.

First is the psychology of risk. Climate change is occurring gradually and its impact seems distant or geographically remote. It is much easier to focus on day to day issues like the economy or Ebola outbreaks or fundamentalist terrorism.

Even extreme weather events like Hurricane Sandy have only a temporary and limited effect in galvanising public support to take action on climate change. Malcolm Gladwell explores this phenomenon in his book David and Goliath, using the example of how the confidence of Londoners in World War II, far from being crushed by the German Blitz, was instead enhanced because of the way the majority of people respond to near misses and traumatic events by gaining a sense of resilience and invulnerability.

In fact, the more climate scientists issue doomsday warnings of cities being submerged, crops ruined by searing heat waves, drought and so on, the more impervious many people are becoming. Human history is littered with stories of civilisations collapsing after failing to manage local resources sustainably, such as food, water, timber and fuel. Often there are ample warnings of impending calamity, which nevertheless go unheeded until it's too late, as recounted by scientist Jared Diamond in his book Collapse.

The age of our leaders also affects their risk psychology and consequent policy decisions relating to climate change. Politicians as a group tend to have an average age that is much higher than the population of constituents they represent. The older one is, the less likely one will experience the impacts of climate change first hand. So warnings of future consequences – even in the second half of this century – seem remote, and this flows into policy settings and decision-making that is more near-term focused.

Secondly, **climate change is an international problem** and effective mitigation requires a coordinated international response to reduce anthropogenic greenhouse gas emissions. There is a precedent for this in the form of the Montreal Protocol, which was ratified by most of the world's nations and required relatively rapid curtailment of the use of ozone depleting chlorofluorocarbon (CFC) gases.[3] However, there are factors at play this time around that are actively working against the chances of a global agreement, with many countries waiting for other countries to act, citing concerns they could jeopardise their economies by taking action in isolation.

Another major obstacle to multilateral agreement is that the highest growth in greenhouse gas emissions is coming from rapidly developing economies such as Brazil and India. However, it has been the major Western economies that have benefitted most from the use of the energy released from burning fossil fuels (and amongst other things the emissions associated with higher consumption of meat). Meanwhile the developing world has only fairly recently started emitting greenhouse gases in bulk, as countries have adopted more liberal economies and realised that one of the keys to prosperity is the availability of energy. This has led to alarming sound-bites such as the assertion that China is commissioning a new coal fired power station every week to meet the needs of its emerging upper and middle classes (fortunately China has recently announced measures to arrest this growth and is already the largest investor of renewable energy, though its emissions are still growing).

Understandably, when developed countries have sought a global agreement to reduce greenhouse emissions, many developing countries have argued that since the West has had a 200 year head start and has contributed the bulk of anthropogenic (human caused) emissions to date, it should be getting its own house in order through deep cuts before seeking to impose its will on

3 Incidentally, CFCs are also greenhouse gases, though so too are the hydro fluorocarbon (HFC) compounds that have generally replaced CFCs.

developing nations that have not shared the benefits. The contentious topic of funding for developing nations to implement emissions cuts has been another reason that climate talks stalled over the last decade.

Thirdly, unlike the depletion of the ozone layer, which required a relatively narrow set of changes – the substitution of CFCs for non-ozone depleting refrigerants and propellants, which were available at minimum additional cost and required few if any changes to product design or use – mitigation of our GHG emissions requires a **much more fundamental, expensive and challenging transformation**.

Our current economy is – literally – built on oil and other fossil fuels. Consider these facts:[v]

- Around 88% of the world's energy consumption comes from burning fossil fuels.
- Global energy consumption increased by 27% between the 1990s and 2000s (decadal total 1994-2003 vs 2004-2013). Despite the increase in renewables and other non-fossil fuel energy sources, global consumption of fossil fuels has still increased 27% over the last decade, in lockstep with overall energy consumption. Over 96% of vehicles rely on fossil fuels apart from a small fraction using bio fuels and a tiny percentage of electric vehicles.[vi]
- Oil and the byproducts of the process of turning it into petroleum are principal inputs used in over 6,000 products, from fertilisers that are currently critical to food production, to plastics, toys, perfume and soap, insecticide, asphalt, shoe polish and paint.
- 55% of a typical equities-based superannuation fund is made up of companies whose main activity relates to the extraction, distribution and exploitation of fossil fuels.[vii]

In short, conquering our fossil fuel dependence requires wholesale changes to a broad range of critical economic systems including energy, transportation, food production, housing, urban planning, manufacturing and even the services economy.

And that's just the start. In addition to the burning of fossil fuels, another major contributor to global warming is agriculture, forestry and other changes to land use.[viii] According to UN data, deforestation for farming, forestry and other reasons currently results in a net loss of forest cover equivalent to about 5.2 million hectares per annum – an area the size of Costa Rica.[ix] While this

rate has decreased over the last couple of decades due to concern about the environmental and longer term economic impacts, the challenge of feeding more people and producing more wood products contributes nearly a third of the world's anthropogenic greenhouse gas emissions. Arresting this impact would take substantial adjustments to our approach to food and timber/pulp production.

Similarly, industrial processes produce a range of greenhouse gases that are independent of energy consumption.

For example, the cement industry is estimated to produce 2-3% of total anthropogenic emissions due to the chemical processes involved in concrete production and usage. That's independent of the energy-related emissions associated with cement production, which are estimated to produce a further 2% of greenhouse emissions.[x] Steel production and other chemical processes produce significant greenhouse gases on top of the emissions associated with the energy used in production.

Fourthly, in countries influenced by right-wing political groups, **faith in the virtues of a market-led economy** and consequent anathema towards perceived "big government" intervention is restricting action. A parade of eminent economists has studied the emissions mitigation challenge and concluded that government intervention in the form of progressive, redistributive carbon taxes and/or cap and trade or cap-and-dividend schemes is the best means of achieving rapid, incentive-driven emissions reduction. Greenhouse emissions are a market externality, which for the psychological and other reasons discussed above, are not priced effectively (if at all) by free markets.

Fifthly, our greenhouse emissions are themselves a symptom of a more fundamental problem to do with our **relentless pursuit of growth**: consumption growth and economic growth, the engine of which is population growth. Statistician and demographer Hans Rosling[xi] has demonstrated that the global population should peak at around 10 billion people by the middle of this century. That's just 35 years to add an extra three billion people. Mind you, in the previous 35 years the earth's population rose by 66% (from 4.3 billion in the late 1970s to 7.1 billion in 2013), so it's not at all unrealistic.

Whereas global food productivity managed to keep pace with the last 35 years of expansion, that was due to the so-called green revolution launched by the plant breeder Norman Borlaug in India, which pushed synthetic fertilisers

and other techniques across the globe, while also exploiting vast new tracts of increasingly marginal arable land. Those techniques have created new problems such as leached or salinised soils and agricultural run-off polluting and endangering many river, lake and coastal ecosystems. Not to mention exploited fisheries and significant methane emissions from cows and sheep.

Now that we've used up most of the tricks in the green revolution playbook, we're going to need a new script to feed the next three billion mouths.

No wonder, therefore, that a powerful and insidious denialist movement – funded by organisations and individuals with a vested interest in maintaining the fossil-fuel leadership status quo (and starring some of the very same actors previously involved in the denial of the health risks of tobacco) is actively spreading doubt about the science and fear about the economic impacts of doing something to reduce global emissions. And doing so while also ignoring or downplaying the potentially catastrophic impacts, both economic and environmental, of doing nothing. The extent of these activities is well documented in Erik Conway and Naomi Oreskes' 2010 book Merchants of Doubt.

The denialists' misinformation campaign has been so successful that a recent survey[xii] in the United Kingdom found that despite the almost unequivocal scientific consensus, only one in nine respondents (11%) understood that the science is settled. Another 11% thought that a majority of scientists actually rejected the notion that humans are to blame for climate change and 35% thought scientists were evenly split on the issue. Other surveys[xiii] have found only a small majority (56%) agree with the statement that "climate change is happening and is mostly caused by humans".

With all these factors conspiring against meaningful action to curtail emissions, global attempts to implement binding emissions reduction targets have stalled or failed in recent years. And each year without deep emissions cuts makes the prospect of avoiding significant levels of climate change (and along with it a host of mostly negative impacts) more remote.

Even the landmark deal reached in Paris in December 2015 falls well short of what is required, with the combined national commitments estimated to reduce business as usual greenhouse emissions only sufficient to still lock in at least 2.7 degrees Celsius of global increase (down from four degrees). The agreement won't take effect until 2020 and in any case needs to be ratified by individual countries. And of course countries then need to make good

on their pledges, which will require multi-trillion dollar investments and the mothballing of various emissions intensive activities (more on that later).[xiv] Some governments will face significant political pressure to avoid that spend or divert it to other projects.

Delay in implementing a solution is not the smart solution.

To borrow terminology from the game of cricket, the current "required run rate" is around a 6% global reduction in carbon emissions every year to keep average temperature increases within the two degrees Celsius so-called "safe" limit. The current trajectory: between 2012 and 2013 global anthropogenic emissions were estimated to have risen by 2.3%, with a forecast 2014 growth rate of 2.5%.[xv]

In short, climate change is a so-called "wicked problem",[xvi] characterised by "incomplete or contradictory knowledge, the number of people and opinions involved, the large economic burden, and the interconnected nature of these problems with other problems".

However, this book is not about trying to convince you that global warming or climate change is real. It's only going to talk incidentally about limiting your emissions of greenhouse gases or reducing your personal or organisational environmental footprint.

Rather, we're starting with the following assumptions, based on what science and our observations of human behaviour tell us:

1. global warming is occurring and its effects are already being experienced;
2. it has largely been caused by human activities;
3. it's causing a chain reaction of climatic and environmental consequences;
4. global action to limit emissions significantly may not happen in time to prevent irreversible and significant levels of warming; and therefore,
5. we're going to need to adapt to those impacts.

Climate change has many downsides. In time, our society will be irrevocably altered in ways that will cause immense suffering and limit the opportunities of billions of people. Some communities and businesses are already feeling the initial impacts today. We'll address the business impacts in the following chapters.

But there are also plenty of opportunities for organisations prepared to transform themselves to meet the climate challenge.

Our society will need new, sustainably produced products and services to help us:

1. reduce our greenhouse emissions to avoid environmental impact (a process that is generally referred to as mitigation);
2. adapt to the impacts of a changing climate (adaptation);
3. reverse the environmental degradation that we have caused the planet; and
4. engineer a more sustainable, steady-state economy.[4]

Indeed, a raft of reports have been released in the last year or so from regional and global think tanks and supranational organisations including the World Bank[xvii], the UN IPCC 5th Assessment Report, Working Group II – Impacts, Adaptation and Vulnerability[xviii], the Risky Business[xix] think tank (led by notable US Republican Hank Paulson, the former Secretary to the US Treasury during the George W Bush Presidency and Independent Michael Bloomberg, the previous Mayor of New York) and the Global Commission on the Economy and Climate. These reports all point to the clear economic benefits inherent in transitioning to a new way of doing business.

We call it the Adaptive Economy.

This book is aimed at business owners seeking an edge for their organisations in the Adaptive Economy.

In **Part 1** we're going to look at the downside risks of climate change: what it actually means for businesses and how they should go about assessing their risk levels. Then in **Part 2** we'll look at the growing range of opportunities for new products and services that is being created by growing awareness and experience of the impacts of a changing climate and its causes. **Part 3** considers the limitations of many corporate sustainability programs and steps

4 There's also a fifth business prospect, which is simply to exploit market opportunities caused by a changing climate, and the environment be damned. One such example is moves by major oil companies to extract oil from under the Arctic ocean in areas that have recently become accessible due to ice melt. It's a sad irony that the improved accessibility is caused by the burning of fossil fuels including oil. It's a perverse form of profiteering but perhaps a harbinger of the wild west opportunism and self interest that lies in store.

to crafting a strategy for your business that will propel it forward into the Adaptive Economy.