

CHAPTER 1

INTRODUCTION: STOP WORRYING

On a mountain halfway between Reno and Rome,
We have a machine in a Plexiglas dome
Which listens and looks into everyone's home.

Theodor Seuss Geisel,
Dr Seuss's Sleep Book, 1962¹

The machine in the Plexiglas dome is not found in a mountain; it is a small computer on a desk in an obscure room in that New York slab of hope that is the UN skyscraper. Inside the slab, on 3 May 2011, the United Nations Department of Economic and Social Affairs published a revision to global population estimates, and what was revealed was something of a surprise.²

Before May 2011, the latest global estimates had suggested that world population would peak at 9.1 billion in 2100, and then fall to 8.5 billion by 2150. In contrast, the 2011 revision suggested that 9.1 billion humans would all be alive at the same time much earlier – maybe by 2050 or before – and that by 2100 there would be 10.1 billion of us, with our numbers still rising in a century's time.

Initially the world's press did not react in horror at the news that we could soon be ten billion. Population forecasts are incredibly fickle numbers, and the long-term

prognosis was still for imminent global stability. What had happened was that the news had come in from some place – for now let’s call it the County of Keck³ – suggesting that a few (million) more babies were being born than had previously been the case, and a few less folk were dying.

Just a tiny change in fertility can be magnified in a century to an extra billion human beings. A tiny change in the other direction, a few (million) more people using condoms, and there will be fewer than eight billion of us in the near future. But how much does it matter? What difference does an extra billion, or a billion fewer, people make? Should we be concerned that the global human population count is currently on target to top ten billion, or are there more important things to worry about?

This book suggests that the actual number of people on the planet is, to an important extent, incidental to the impact humans have on both the environment and each other. It also suggests that many people are coming to understand this – which is why the news of an expected extra billion humans within three score years and ten did not result in panic. Instead, it’s not how many of us there are but how we live that will matter most.

There are many signs that we may well collectively be choosing more often to live sustainably, not least in how we are already controlling our numbers. This is a book for pragmatists. It is about how ten billion people can live well on this planet. I do not argue that they will; just that enough evidence exists to suggest it is possible. So here is a story about that possibility. It is based on many facts, but it will almost certainly turn out to be a fiction of one kind or another. We can never know what will happen, but that is no excuse for not being interested in the future, nor for failing to try to influence it.

The story that follows is broken up into chapters marking

the point at which each billion human milestone was passed, or is expected to be reached. Within each chapter I have tried to place those contemporary debates most pertinent to that number of people. Chapter 2 considers the very long time it took to get human numbers up to five billion, and how even then some still claimed there were too many people. Chapter 3 takes us up to the year 2000, six billion people and concerns of disorder and peak consumption. Chapter 4 moves forward only to 2011, seven billion people and, among many issues, concerns for future energy supplies. That is the end of the first half of the book; the rest is speculation.

Chapter 5 considers the years up to 2025, to there being eight billion of us; it raises concerns about food and water, but also presents new thinking that we may be collectively becoming clever enough to organize ourselves better. Chapter 6 takes us forward to 2045, to nine billion people and questions of border controls and economic inequality. Chapter 7 is as far ahead as we venture, to the ten billion projected at the end of the century, and asks what they might then be living without, but also how they might be better-off than us. Finally, Chapter 8 casts a little doubt over whether there ever will be that many of us alive at the same time, and gives a long list of reasons to be hopeful about the future. The remainder of this chapter, like most of the book, is about competing and constructing stories. It concerns how we come to believe, and is about how changing some of our beliefs might be the key to our collective survival.

Discovering a new world

‘Story telling is not in our genes or evolutionary history, but it is the essence of what makes us human.’

David Canter, Professor of Psychology, 2012⁴

Human beings progress by telling stories. One event can result in a great variety of stories being told about it. Sometimes those stories differ greatly. Which stories are picked up and repeated and which are dropped and forgotten often determines how we progress. Our history, knowledge and understanding are all the collections of the few stories that survive. This includes the stories we tell each other about the future. And how the future will turn out depends partly, possibly largely, on which stories we collectively choose to believe.

Some stories are designed to spread fear and concern. This may be because the story-teller feels there is a need to raise some tensions. They might feel that facts are being overlooked, or that their point of view is not being taken seriously enough. To get attention, people sometimes tell stories to shock their listeners. For instance, one recent story refers to an apparently otherwise mild-mannered Cambridge University academic recommending that we should teach our children how to use guns so that, in the apparently inevitable forthcoming population Armageddon, they will have a better chance of survival.

Stories of us descending into a *Lord of the Flies*⁵ world are frightening; they are totemic warnings: 'Fail to act now and we are all doomed.' They suggest that if we do not act in the way the protagonist would wish us and everyone else to act, the consequences will be dire, with our genes, our offspring, doomed to some kind of survival of the least empathetic. The only survivors will be those who find killing easy; what some call 'the fittest'.

For each generation the warnings are updated, although encouragingly, there are now caveats about the fallacies of such warnings; today the message of the book *The Hunger Games*⁶ is taught in schools where I live in England more as a warning to beware selfish adults than as a prophecy

that soon hunger will spread. At school I was made to read *Lord of the Flies* to try, I guess, to make me fearful of anarchy or tribalism.

Just as there are stories that we are all doomed, so too are there stories that all will be fine as long as we leave everything up to a few especially able, if often a little selfish, adults. Currently this trend is led by those who occasionally describe themselves as rational optimists.

Self-titled 'rational optimists' tend to claim that it is human nature to compete and to trade, to want above all to profit at the expense of others. They often use what they present as Darwinian arguments which suggest that people reached this point naturally, not realizing how people have evolved to become less selfish as they work in larger groups, and that only a minority of humans are quite as selfishly driven as the so-called rational optimists are. Rational optimists suggest that people will find a set of solutions to their problems driven by greed above all else. Pragmatists should doubt this.

The story-tellers of rational optimism like to try to paint themselves as sensible but cheerful folk. One, Matt Ridley, has argued forcefully along rational optimist lines.⁷ His story suggests that it is mostly people trying to become rich ('wealth creators') who help others along the way, even if they cause a little hardship as they do so. Matt is the 5th Viscount Ridley. His family made its fortune by owning coal mines in northern England in Victorian times. He himself was chairman of the bank Northern Rock at the time of its collapse, the collapse that triggered the financial crash in Europe. Given his background and business failures, it is not hard to mock his views, but they need to be taken seriously because they are part of the current mantra of many at the top of the tree.

Matt's brother-in-law, Owen Paterson, was made

Environment Secretary by the British prime minister in September 2012. Owen thinks like Matt. Currently he is buying into the family tradition of promoting carbon extraction and pollution as progress: 'he wants to end all energy subsidies and fast-track exploitation of shale gas. This would shatter any ambition for the UK of keeping to targets for renewables or greenhouse gases.'⁸

The views of people like Matt Ridley and the idea that they are taken seriously by so many in positions of power, despite their practical failure through the ages, can bring others to the brink of despair. The failures on Matt's part alone in the rational optimism fable – the suggestion that greed will prevail – range from his family's private mining endeavours requiring nationalizing, if just to bring in a little humanity for the coal miners, to the collapse of the privatized building society he chaired, resulting in the first run on a British bank in living memory. However, stories about how greed is ultimately good give people with power and wealth a warm feeling that they are somehow part of the solution. This is why such stories have a lot of clout behind them, and why they spread.

Angry pessimists counter rational optimists with stories that try to expose such fanciful musing. They warn of what may happen if the rational optimists are believed. The term 'rational optimism' itself is a misnomer, labelling all others as being irrational and holding pessimistic views on human nature, to be compared with the supposedly optimistic but hard-faced corporate elite.

What we need more of are 'practical possibilists' and their stories; stories that sit between those who say that all will be fine, and those who claim that we are doomed. I believe that there is a chance we might stumble through after all, just as we have in the past. Whether you think this is possible depends on which stories you hold to and

how you act on them. If greed prevails, we are probably doomed. If doom-mongers prevail, who is going to care about trying to prevent the greedy from hammering the final nails into humanity's coffin?

Right now, different people are telling very different stories of how the world works. Maybe it was always like this? However, at times of greater stability, the stories tended to become more uniform. During such times, speaking out of turn could be heresy. Galileo, for example, suggested that he had discovered that the earth orbited the sun, a crime which he almost paid for with his life. Today we have hundreds of professional and thousands of armchair astronomers gleaning knowledge, each looking through differently focused telescopes, all appearing to discover a slightly different story of the current arrangement of our galaxy, and each forecasting a very different world to come.

In summer 2012, in London's exclusive Sloane Square, a play was put on at the Royal Court Theatre. It featured a computer scientist with a background in biology named Stephen Emmott.⁹ The play was a monologue of his agonizing over what is to be done (to save humankind). What was it that brought Stephen to tell his story, a story of a man who appeared to be past the brink of despair? The answer was the arguments of those self-styled rational optimists and their claims that unbridled selfishness, left unfettered, would bring all the solutions needed to safeguard the planet's future; population growth, climate change, poverty, everything could be solved by greed!

In Britain, just as Matt Ridley personifies rational optimism, Stephen Emmott is the embodiment of angry pessimism. Wherever you live, there will be the equivalent pairs of individuals. Stephen knows that people seeking only to profit financially will not come up with the solutions needed. He works through their arguments, but is so

alarmed that he ends up quoting the colleague advocating teaching children how to use firearms (see below). Surely there is a middle way between the apparently opposing world views of these two forceful men? Here is an account of Stephen's position:

What's to be done? Emmott takes us through the ideas offered by 'the rational optimists' who believe that, faced with the species' near extinction, human inventiveness will engineer a solution. Desalination plants, a new green revolution, seeding the oceans with iron filings to absorb more CO₂: all of these threaten to produce as many problems as they solve. He believes the only answer is behavioural change. We need to have far fewer children and consume less. How much less? A lot less; two sheets of toilet paper rather than three, a Prius instead of a Range Rover – that kind of sacrifice won't really do it. And does he believe we're capable of making this necessarily far bigger curb on our desires? Not really. He describes himself as a rational pessimist. 'We're fucked,' he says. If a large asteroid were on course to the Earth and we knew when and where it would hit – say France in 2022 – then every government would marshal its scientific resources to find ways of altering the asteroid's path or mitigating its damage. But there is no asteroid. The problem is us. Recently he asked one of his younger academic colleagues what he thought could be done. 'Teach my son how to use a gun,' said the colleague.¹⁰

Just as Matt Ridley has a history, Stephen Emmott can be shown to be an interested commentator. He has a lab of scientists to fund, and needs powerful people to be concerned with these issues. Apprehension that we are facing

a worrying common future is widely held; if it is not population numbers, it is often something associated with those numbers. Some people hope that their country and their family might be safe as disasters are concentrated elsewhere; others see that there are no escape pods from earth.

The world is awash with newspaper stories, TV shows, films, plays and above all books concerning the end of eras, the great crises to come, the crisis we are experiencing now, how we are living through the annihilation of many species, through climate catastrophe, impending pandemic, clashes of civilizations, economic meltdown. You name it – someone will be suggesting we fear it. There will be things we should fear, but what should we be most frightened of and what should we not worry about?

Nothing is too bizarre when it comes to fears over future human population numbers. There is even a voluntary human extinction movement that suggests that the best that can be done for the planet is ‘phasing out the human race by voluntarily ceasing to breed [which] will allow Earth’s biosphere to return to good health’. However, even this group may have some conflict of interests, as on their web page there is also a button labelled ‘How do I order stickers, T-shirts, and stuff?’¹¹ It is as if the only group out there without a profit motive is the group in the middle who we have yet to meet, the boring old practical possibilists. There are no T-shirts to buy with the slogan: ‘There probably is enough food for all’, or: ‘Worry less, humans are cooperative’. What is reassuring tends also to be bland.

It could all go wrong. We could have a global famine. We might descend into a global war, the first true world war that includes all countries. It could happen. But it might not. This book is about why and how it might not. The argument here is not that we have reached the end of history – a twenty-year-old prediction of that turned out to

be remarkably premature.¹² Neither does the book imply that we can sit back and all will be OK. That has never happened before, so it is unlikely to occur now. This is also not a book suggesting that technological change will save us; such ideas have also been suggested often before as a panacea. What it does point out is that there are many hopeful signs that are often overlooked, signs which have mostly only recently become apparent and which it is worth observing if, at the very least, we are to keep our hopes up.

Reasons not to be pessimistic abound. Only very recently has it become commonplace to be able to say: 'By most estimates, the explosive population increase still under way will end near AD 2050 as global population levels out at some 9–10 billion people . . .'¹³ We can now see that human population growth is not just slowing, but is set to stabilize within the current lifetimes of a majority of people on the planet; these should be the first people to see that occur without it being caused by the Black Death pandemic of 763 years ago!

The majority of the world's population is young. Most people alive today will be alive in 2050. The mid-century date is coming around when, for the first time in centuries, the sun will rise over the Pacific and cast its light on one fewer living soul than the day before. For the first time ever, that can occur without it being due to thousands more suffering from both unusual and agonizing deaths than the numbers who are born that day. The population explosion is ending peacefully.

The deceleration of the growth of our algae-bloom-like explosion of humanity is just one reason to set the worst pessimism aside for a while. A further sign of hope is that for the first time ever, the large majority of people alive today are literate. Around sixty millennia ago, a majority

of humans learnt to speak. Only within the last sixty years have a majority learnt to read and write. It is no coincidence that this is happening just as we can expect to see human numbers fall not due to disaster, but due to the winning of rights, principally women's rights.

There are more signs. For the first time ever, almost everywhere, women are about to live longer than men.¹⁴ Women are fitter, but a combination of patriarchy and lack of care during childbirth has until now killed more of them earlier than men. Very soon, maybe already, a majority of people on the planet will be female, as we now live long enough for this to occur. This will be the first ever female majority of humans on the planet. It will happen any day now.

For the first time ever, majorities of people today say they would not fight for their religion, their country or creed if told to. In addition, the current generation are the first to mostly live in cities, to mostly have the vote; almost everywhere in the world there is a vote of one kind or another. The majority of those alive today have heard a radio and hence have received ideas which have leapt over great distances and old customs. Print and the moveable typeface did the same in the past, but only for the minority who could then read.

Practical possibilists rejoice in trends that suggest that a decent human future is possible. Typical of this group is Hans Rosling, the Swedish doctor now best known for his Gapminder movies and YouTube talks.¹⁵ For practical possibilists, a term coined by Hans, it's not how many of us there are but how we live that will matter, and – as I'll show in the chapters which follow – there are many signs that we may well collectively be choosing to live more sustainably, and that this is occurring far faster than could have been expected a generation ago.

As geographer Ash Amin, another possibilist, puts it, referring in particular to those who are afraid of extra people and especially immigration: ‘It is time to give a politics of reasonableness a chance, to stop the politics of purge from ushering in the calamity it purports to avoid.’¹⁶ There are signals in the language writers are using, in the points commentators are now making, that the plots of some of our most common stories are changing, but so too are the facts we unearth about ourselves. Not least among these are signs that reasonableness and practical possibility may be flourishing anew. This is the emerging story of how we are already controlling our numbers and avoiding calamity, not through authoritarian diktat, but as we rebound from a population explosion and what was a huge historical and geographical shock – the ‘discovery’ of the New World. But to understand all this, we have to take it step by step, steps of one billion at a time.

Although Chapters 5 to 8 in this volume are all about the future, this is mainly a book about the present and how it concerns the future. It is also a book about new ideas about the past. These are often ideas that have only emerged within the lives of most people currently alive. Just as our population numbers have only very recently exploded, so too has our understanding of who we are and our theories about how we got here.

Principal among the new ideas that influence the story of this book is the concept of *geographic shock*. Just over 500 years ago, when my great-grandfather’s great-grandmother’s great-grandfather’s great-grandmother’s great-grandfather was alive, we encountered a new planet, a planet with a human population. It was a shock, such a shock that we called it the New World – the Americas.

At school I was taught that we in the West discovered the New World rather than encountered it. But that semantic

change from 'discover' to 'encounter' itself tells you how quickly understanding is changing. We also now laugh at how it suited schoolteachers to describe the Spanish people as advanced, and the economic exploitation of the Americas as some kind of scientific discovery. We are changing our ways of thinking about the world faster now than we have ever done. Our collective human thoughts, our collections of aggregate knowledge, are rapidly evolving as we learn more about our own evolution.

Our future is not in our genes but in our minds and our collective ability to organize. *Not in our Genes* was a book written in 1984 by Steven Rose, Dick Lewontin and Leon Kamin as a response to the excesses of sociobiology, and was so good that it upset eminent biologists, who claimed it to be an 'idiotic travesty'.¹⁷ However, if our collective future is not held in our individual genetic constructions, then that future will not depend on either some rational optimist's survival-of-the-fittest fantasizing, or some angry pessimist's despair that only those most inclined to be brutal among our offspring will make it through, those we teach to shoot the straightest but who are somehow able to not blink as they kill.

We now know that groups that are more cooperative fare better, but within each group individuals that are a little more greedy gain more. More cooperative groups curtail the greed of the few and help them to control their excesses, as well as benefiting all the rest who would otherwise suffer from such selfishness. This is a theme that will run through every chapter of this book because it becomes more important the more of us there are.

It is true that when it comes to each of us individually suffering some plight, such as heart disease, 'it is mostly genes and chance'¹⁸ and very much more chance than genes.¹⁹ But when it comes to what happens to groups of

people, our genes are now so mixed and mutated as to elevate human traits that are beneficial to us all. It is not our personal abilities that vary much; instead it is what we do with our common natural endowments that matters and can vary most.

When the New World was first encountered, both genes and the lack of conditioned immune systems did matter. Those humans who had never before been exposed to Old World illnesses died far faster from those diseases than from any conquistador's sword. Those people who did not carry genes that protected them from malaria and yellow fever perished quickly.²⁰ Back across the Atlantic, the shock was so great that the economy of the Old World was transformed; riches plundered from the New World turned the social order of continents upside down.

After 1492, the western edge of the Old World, which was so often drawn at the bottom of old maps, grew to be the richest place, the east of the Old World was destabilized, and what we now call capitalism was born in response to the shock of the 1492 'encounter'. Geographically, the peninsula of Western Asia became so powerful that it could successfully apply its once minor label – Europe – as the name of an apparently entirely separate continent.

From continent to continent human populations began to multiply rapidly as the established social orders were overturned. The first, fastest and most destabilizing population explosion was within Europe itself. Africa was depopulated through the spreading of slavery and 400 years of forced migration, mostly to the New World. India was colonized (twice), Chinese empires were destroyed, partly through the British Empire-orchestrated opiate trade. A North American empire was born.

The shock of encounter still isn't over, but the fact that we are finally recognizing recent world history as being

largely a reaction to the geographical shock of the New World's incorporation, rather than some natural evolution of human selfishness and self-destructive tendencies, is a further reason to be optimistic. Shocks can be overcome. And if, after the Neolithic revolution, what we have been living through since 1492 has been the second greatest perturbation in human history, no wonder it has taken us some time to grasp this enormity.

Theories of the geographical shock have not been widely reported outside of the pages of academic journals. There is no uniform opinion as to how important 1492 was to what occurred thereafter. There is a great deal of evidence to suggest that even if most of us are not that selfish or self-destructive, far too many of our leaders are, and that the way we promote such people to the top encourages them. The last five hundred years may not be a great guide to how humans in the next one hundred may fare, but looked at in a certain way, told with a certain kind of story in mind, it is possible to paint a picture which has a rosier, less optimistically combative and less pessimistically catastrophic ending than many presume. That is what a practical possibilist paints.

In the pages that follow, the glass is always at least half full and ever so slowly becoming fuller. It is a story of the signs of hope. It is not that we are entering some utopia; rather that all may be far from lost. The reasons for many of our current calamities might be far from any of our making. We might just rub along OK, and you never know, it is even conceivable that things could possibly get better, especially if we are more hopeful.

Start off by seeing the tales underlying much of recent human history as being those of the shock of the new, and a global reordering that moves the European peninsulas and islands from the periphery of the known planet to its

centre.²¹ After 1492, Europe became the trade-winds and trade-routes centre. See that change as key and you start from a very different place from the one where most of us were philosophically dropped off at the end of school history lessons.

After the Tsunami, being a 'possibilist'

At present there are no well charted ways for 10 billion people to achieve lifestyles like those enjoyed in the Most Developed Countries, because the only known way forward is economic growth, and that will come into collision with the finite earth. Technology can help, but without socio-political change it cannot solve.

Paul Nurse,
President of the Royal Society, 2012²²

Swedish medic turned world development specialist Hans Rosling loves statistics. His background is in public health medicine and the curing of rare tropical diseases, but he now looks at what is most common rather than most unusual. With the help of his son and wider family he popularized the animated bubble chart. How did he do this? He charted stuff of great importance, and if all that failed, he swallowed a sword live on stage to wake the audience up to what his animated graphs were showing.

Hans Rosling's graphics show that the world is rapidly changing. As he himself admits, he's not an optimist, he's not a pessimist, he's a 'possibilist'. He just happens to be the possibilist who has done more than any other living human being to show statistically that a better world is possible, not least when it comes to understanding declining fertility and rising freedom. As he says: 'so when you

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discuss resources and when you plan for the energy needs for the future, for the humans on this planet you have to plan for ten billion'.²³

To plan is not to say that the future will be OK, that you can decide now what it will be and it will be that way. To plan is to prepare. To plan is to accept that it is possible to imagine a world containing ten billion people, but also to say what conditions would necessarily have to be in place for that world to be both sustainable and pleasantly habitable. It could be a world of a great many wind farms, and people wearing their shirt for three days or more, so that energy would not be spent unnecessarily washing clothes too often, most especially when wind speeds were low.

A recent report by one respected think tank found that the 'reliability and security of wind power does not depend on the variability of wind but instead on how well changes in wind power output can be predicted and managed'.²⁴ Wind energy is viable and is predictable enough to keep (reading) lights on, but it may not be predictable enough for some industrial processes to be kept running at any time of day or night should we wish to run them like that.

A possibilist sees what is possible. It is possible to generate enough electricity to read at night and to wash clothes as much as they need washing. It may not be possible in many places on earth to produce enough energy in future to smelt as much aluminium as some may wish to, even if this is achieved by hydro power.²⁵ Providing energy to keep us clean and warm is possible. Providing enough for some of our most extravagant wishes is not. Sometimes that extravagance is simply wishing to have an endless supply of cans of baked beans. What is unsustainable is the can, not the beans.

Almost every practical possibilist report that is published attracts instant detractors. A few of the readers of the newspaper in which the report on wind power reliability first appeared reacted predictably. One was particularly angry: ‘Sorry DT [*Daily Telegraph*], this article is utter bullsh*t and you know it. The report is biased, was written by the wind energy company.’ Both angry pessimists, who see little chance of wind power without nuclear backup providing an alternative, and rational optimists, who often think that climate change is not severe enough to stop burning coal, react with apoplexy when it is suggested that there might be solutions that already exist, that require little technological development, but which do require a change in common conceptions of how much power we really do need and what levels of reliability might be acceptable in future.

Think tanks veer between distributing optimistic and pessimistic stories. A week before that spat on windmills took place, a portent of doom was announced. On 22 August 2012 it was proclaimed around the world that ‘Today is Earth Overshoot Day . . . a concept originally developed by the Global Footprint Network and the UK based think tank New Economics Foundation (NEF) which represents the annual marker of when we begin living beyond our means in a given year.’²⁶ Many readers might have thought, ‘so what, it’s just those greens moaning again’, but the story came with an extra warning. Earth Overshoot Day was moving backwards in time.

Annual commemorations around the world are mostly supposed to be positive and full of hope and expectation, but Earth Overshoot Day has been designed to lack festivity. In 1992, this date was said to have fallen on 21 October, while in 2002 it was ‘celebrated’ on 3 October. Ten years later, in 2012, the date of 22 August was announced as the

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point during the year by which we had collectively consumed too much. Each year in the 1990s the date moved forward 1.8 days. Each year in the noughties it shot forward 4.2 days!

If the rate of our accelerating approach to Armageddon is to continue to speed up, then Earth Overshoot Day will begin to move forward 6.6 days a year during the next decade, to be announced at mid June in 2022. A further nine days a year in the following decade and it will be in March. Soon Earth Overshoot Day could even fall before the first signs of the northern hemisphere's spring, which are themselves moving forward in time. The underlying message of the numerical literature is that we'll never reach 2040 if the current rate of planet-burning and wasting continues to grow unabated.

The 'Overshoot Day' press release that sparked concern during 2012 continued to give further details, and in many cases these were turned straight into newspaper copy. One story read:

Given current trends in consumption, Earth Overshoot Day tends to arrive a few days earlier each year. This day marks the approximate date our resource consumption for a given year exceeds the planet's ability to replenish. From this day on, it would mean that humanity has exhausted nature's budget for the year and we are operating in overdraft. After today, we are already in 'debt' towards nature and planet Earth and this is where the other name of the day (Ecological Debt Day) comes from.²⁷

Debt is scary; debts have to be repaid if you are not to become a pariah. Stories about Earth Overshoot/Ecological Debt Day are the stick; stories about the potential reliability

of wind power are the carrot, but between these buffetings of doom and optimism it is easy to lose hope and interest, or to think that this is all too much to comprehend. It has even been suggested that the planet is currently entering a new geological phase, the Anthropocene,²⁸ as the effects of humans are now significant enough to alter climate, the environment and hence eventually the deposits laid down in rock strata. But will our layer of rock be thick, thin, or extremely thin?

The two think tanks referred to above, IPPR and NEF, did not coordinate their reports. Faced with an onslaught of over-jingoistic suggestions that a country's economy depends on it being willing to burn more fossil fuel, or build more roads for more cars, researchers who recognize the dangers may well feel forced to produce estimates of how the end of times is approaching more rapidly than was thought a few years ago. Be afraid, be very afraid, be even more afraid than you were last year is a message that can lose its edge in the same way as does crying wolf too often. In the long run, the more pedestrian, the possibilist, the reasonableness of softer stories may gain surer ground. Being afraid only gets you so far; being determined moves you further on; being better informed can give you hope.

Ultimately no amount of new wind power or other technical changes to how we produce energy or grow food, build homes or travel, will solve our growing problems of overconsumption and greed without our changing how we behave and what we wish for. We who consume most have to consume less. However, there are many recent reports that demonstrate how it is possible to reduce consumption in rich countries. Many are used throughout this book to show what is already taking place. The least visible changes are happening in those homes where increasingly

people buy a little less of what they don't need and recycle a little more of the waste from what they do need. The most visible changes occur when change is suddenly forced upon people.

The 11 March 2011 Japanese earthquake was so powerful that 'parts of eastern Japan are now 12 feet closer to North America and Japan has dropped 2 feet in height'.²⁹ More than 20,000 people were killed by the subsequent tsunami, or pronounced missing and presumed dead. Official life expectancy estimates for the entire country stalled as a result. The financial cost was estimated at being between US\$195 billion and US\$305 billion, and within the first seven days after the earthquake, 18 trillion yen had to be injected into the banking system by the Bank of Japan to prevent outright panic. The yen also rose rapidly in value as currency speculators were reluctant to sell, assuming its value would rise as the Japanese government and businesses tried to repatriate capital they held overseas to allow Japan to pay for the clean-up. For currency speculators, no event is not worthy of trying to turn a profit.

We should not forget how the speculators reacted to the news of tens of thousands of deaths in Japan by calculating how they could come out even further on top financially. They will have added to the costs of the clean-up and rebuild, and led to less being done than could have been achieved without their contribution, and we should blame them for that. A few years earlier, they speculated on world food prices and how those would influence the values of currency, and thousands are thought to have starved to death as a result of their price hikes making food unaffordable in the poorest of places. The inhumanity of a tiny minority can harm both some of the richest (Japanese) and the poorest (starving) people on earth.

The tsunami of March 2011 did not just reveal the worst of human behaviour. It also made far more evident some of the most laudable of human accomplishments. Japan being a very equal country meant people looked out for each other. Food was quickly sent to where it was needed. When I was there, shortly after the disaster, working on collecting statistics on its equality, the students in the university in Kyoto I was based in were collecting for skin cream to send to the north-east. Almost every other need was being catered for.

When I visited the Japanese census offices in Tokyo in early May of 2011, I was told that a very large prefabricated building in the courtyard below me was about to be dismantled and taken north for people to sleep in. It had been full of census forms. I watched people helping each other and being in no fear of each other in a way that was almost the very opposite of what the world had seen when Hurricane Katrina had hit the Gulf coast of the USA just over five years earlier.

I witnessed the most surprising aspect of the aftermath of the earthquake and tsunami while staying in a hotel practically opposite the headquarters of Tepco, the Tokyo Electric Power Company, which had been running the reactors at Fukushima Daiichi and Daini nuclear power stations. That was where reactor core cooling failed, with results viewed with horror around the world. Around the Tepco headquarters were stationed just a couple of riot police, each holding a six-foot staff. That was enough to quell any thoughts of storming the building by angry protestors. Instead, protestors used debate to attack the policy of relying so much on nuclear power. Even before that debate began, many of the 128 million people living in Japan in 2011 became the first large group on earth to be forced to rapidly reduce their electricity consumption.

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The first things that changed in mainland Japan were that the neon lights started to fade along the main streets in Tokyo. It turned out that the country had an incompatible national electricity grid, and so from further to the west, nearer Kyoto, the power could not be drawn off for the east. Nevertheless, almost everywhere people began turning off the lights. At night you could see stars again instead of advertising signs. Homes no longer shone like beacons in the dark. People started taking the stairs rather than the lift. There were concerns about how air-conditioning would be powered in the summer to come, and how the elderly would cope, but in the event, much less power was used and the elderly turned out to know all about coping through difficult times.

What the reaction to the tsunami within Japan showed the world was that it was practically possible to consume less. It is easier to do that if the threat from consuming more is imminent and foremost in our minds, rather than gradual and ever-present. The main threat in many minds in Japan was not simply the potential pollution from relying too much on nuclear power, but the unpredictability of that supply in the event of natural disaster:

Prior to the March 11 accident, Japan had plans to construct nine new nuclear power plants by 2020 and more than 14 by 2030. Nuclear power supplies about 25 percent of Japan's energy, with renewables accounting for around 10 percent. But after the disaster, Prime Minister Naoto Kan advocated phasing out nuclear energy, with an aggressive push for renewables. A poll in June 2011 by the *Asahi Newspaper* found that 74 percent of the public was in favour of abolishing nuclear power after a phase-out period . . . To meet these targets for renewable energy, however,

Japan will also need to reduce its electricity consumption by 50 percent compared to 2010 levels through energy efficiency and power-saving measures.³⁰

Acceptance is spreading of the fact that there has been too much reliance on nuclear power as a supposed technical solution to our addiction to overconsuming energy. In France in late 2012 it was reported that:

the Socialists agreed last year not to field any candidates in around 60 constituencies. In exchange, the Greens accepted the Socialists' goal of reducing France's dependence on nuclear power for energy to 50 percent from 75 percent by 2025 – far short of the Greens' own goal of zero . . . energy companies say they have identified significant deposits of shale gas in the south of the country, Parliament passed a law last year outlawing its extraction via hydraulic fracturing, or 'fracking', because of concerns over its potential to pollute drinking water.³¹

The times really are a-changing, but you have to look around the world to see just how quickly change is coming, and remember how just a few years ago we were so much more cavalier about pollution and our lack of planning.

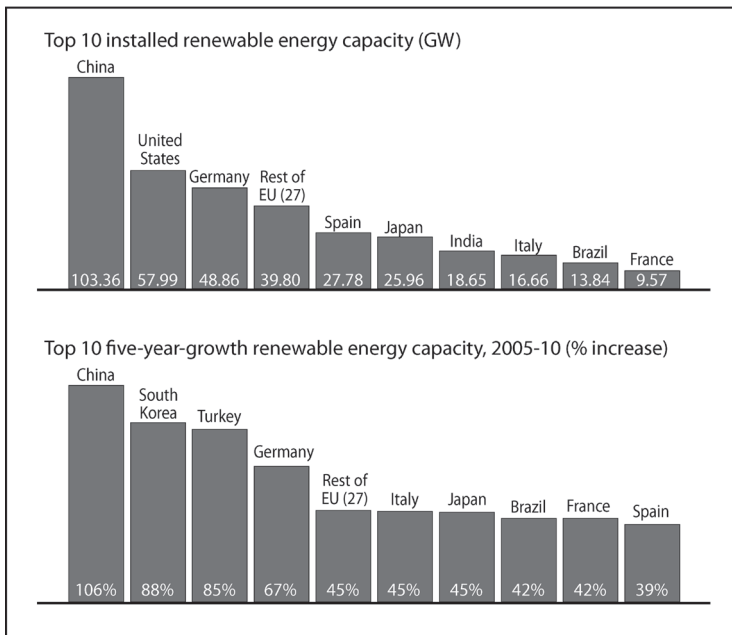
Above all else we have to be prepared to confront some myths. It is common to see images of coal-powered electricity generating plants springing up across poorer countries such as China in an apparent demonstration that whatever is done in richer countries can have only an insignificant beneficial overall effect. In the UK, it is often suggested that we only contribute 2 per cent of global warming. How should we see this in the light of being home to less than 1 per cent of the world's population? This is an exercise

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in testing just how well educated we are in understanding percentages.

China generates over twice the renewable energy of the second largest generator, the USA, despite producing similar amounts of energy overall, and far less per person. Per person neither the UK nor USA gets into the top ten nations by green energy production. If you are a possibilist, then there is so much more that can be done, so much more that is already being done elsewhere, and so much more that we are likely to do to make things better, unless we somehow become more stupid.

The most green energy – worldwide



Source: <http://www.pewenvironment.org/news-room/reports/whos-winning-the-clean-energy-race-2010-edition-329291>.

The long-range forecast

In 1974, in the song 'Idiot Wind', Bob Dylan included a lyric that suggested it was surprising that humans were able to feed themselves given their general level of stupidity. In 1951, possibly before the 10-year-old Robert Zimmerman had even thought of changing his name to Bob Dylan, a group of distinguished scientists published the book *Four Thousand Million Mouths*. They wrote that 'if in the next century we have a population of 4,000 millions as precariously fed as the present population and still expanding [then] there is little time in which to transform an illiterate peasantry into thoughtful and far-sighted men and women, capable of taking the future of their planet into their own hands'.³² Dylan will not have read these words, but he did grow up when the general understanding was that we could barely feed ourselves.

Bob Dylan suggested that we might soon starve in 1974. However, by the end of the twentieth century it was well recognized that we were, on average, 'better fed than in 1951'.³³ It was also becoming clear that we were not all idiots, that it was no wonder that we could feed ourselves and that the global majority of peasantry of 1951 had been transformed. None of us are ever likely to be so far-sighted that we are capable of taking the future of the planet into our own hands, but a majority of people in the world had become working class. All this occurred in just one generation, and within that one generation we, in the rich minority of the world, have also learned to become more modest about what we may be able to know.

John Wilmoth is no idiot. A professor in the Department of Demography at Berkeley, University of California, he was seconded to the Population Division of the United Nations from 2005 until 2007. Wilmoth's main interests

are in longevity, and how long all of us may one day get to live. At the foot of his web page is a tribute to Christian Mortensen, 1882–1998, the Danish American who appeared to enjoy smoking (Danish) cigars almost up to the point of his death, at age 115.³⁴ Mortenson may have lived a long time, but Danes in western Europe generally die a little earlier than their neighbours, it is thought most probably due to their smoking a little more.

What is true for one person – that a man can smoke and live to 115 – is almost never true for the group. When John Wilmoth was asked for his comments on the 2004 UN population forecasts, the first ones to look forward not just 50 years but 300 years, he explained that:

I should emphasize that these comments are highly speculative – they are limited by the inevitable narrowness of my knowledge and experiences, and they are based in some cases on very little empirical evidence. Of course, they are not being delivered entirely ‘off the cuff’, and they do reflect some months and years of thinking about such topics in the present and other contexts. Nevertheless, they are no more than the careful speculations of an informed observer.³⁵

It is often only when people get to the very top of their field that they become confident enough to say that they don’t really know the answers to questions that cannot easily be answered.

On 9 December 2003, the population division of the UN Department of Economic and Social Affairs released a report on the long-term prospects for humanity. It was the first ever official long-term guesstimate. Entitled *World Population to 2300*, it documented the highlights of several years of work which had been quietly undertaken to try to

model a range of possible prospects for humanity.³⁶ As it was the first time the UN demographers had attempted such a bold extrapolation, they were understandably circumspect. As far as I know, to date it has also been the last time such an exercise has been carried out.

When new projections are announced, most attention is given to the middle or ‘medium’ projection, the one it is said is most likely, all else being equal (whatever that means). In 2003, the UN medium projection was that the global human population level would reach 9.1 billion by the year 2100 and then slowly fall to stabilize at 9 billion two centuries later, by 2300.³⁷ If that projection had not subsequently been updated, this book would be entitled *Population 9 Billion*.

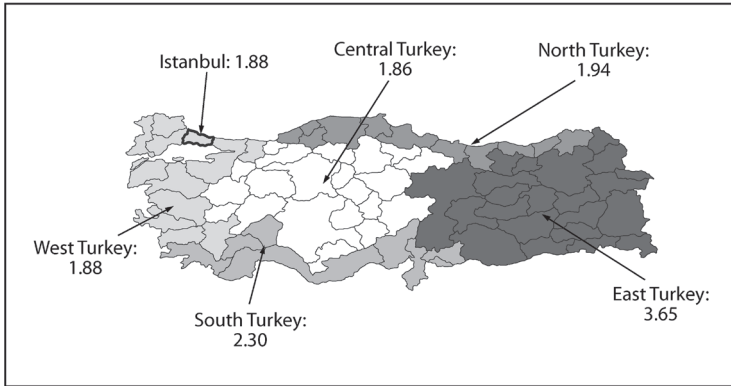
To illustrate just how unsure the demographers were of their estimates, they also published a ‘high’ projection of people having a fraction more children per average family. This results in there being some 36.4 billion humans alive by the year 2300, four times as many as the medium projection. It received quite a lot of media attention. The UN demographers also published a ‘low’ projection of what would happen were fertility falls to be just a fraction below that expected at the time. This one received almost no attention, but I think it should not be ignored. The low fertility assumption suggests that there could be as few as just 2.3 billion humans on the planet by 2300!

If you find talk of rapid fertility decline unbelievable, then consider Turkey a decade ago. Turkey is a country similar in population size to Germany, with 80 million people. Its second largest city, Ankara, is the capital. Its largest city, Istanbul, is more populous than London and yet Istanbul 10 years ago had a lower fertility rate than London has today, namely 1.88 children per couple. Even at that time the Turkish national total fertility was

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2.23 children per couple and falling. By 2010, the World Bank put the national Turkish fertility rate at 2.09. At this rate of decline, Turkey might soon have a lower fertility rate than the UK.

Total fertility rates by region in Turkey, 2000–2003



Source: Sutay Yavuz, 'Fertility Transition and The Progression to a Third Birth in Turkey' (Presentation, Institute of Population Studies, Hacettepe University), 2005. Available at <http://www.demogr.mpg.de/papers/working/wp-2005-028.pdf>.

John Wilmoth suggested that we should be careful about assuming that the low fertility observed quite recently in many places will necessarily continue: 'I would be cautious about assuming the continuation over many decades of a phenomenon that is only a few decades old.'³⁸ However, we should also be cautious about limiting our imagination to think that just because the average number of children per couple in the world has rapidly fallen, those rapid falls have come to some kind of natural end at roughly two children per couple; in other words, at stability.

In a future world where brute human labour is valued lowly, and where, if you cannot pass financial assets on

to your children they may find themselves near the bottom of a very large pile, the incentives to have fewer, or no, offspring are growing. If children become labelled as a financial burden on their parents, if the media start to say that you should not have children if you cannot afford to do so, then why should we be cautious about thinking that the fertility decline has only just begun?

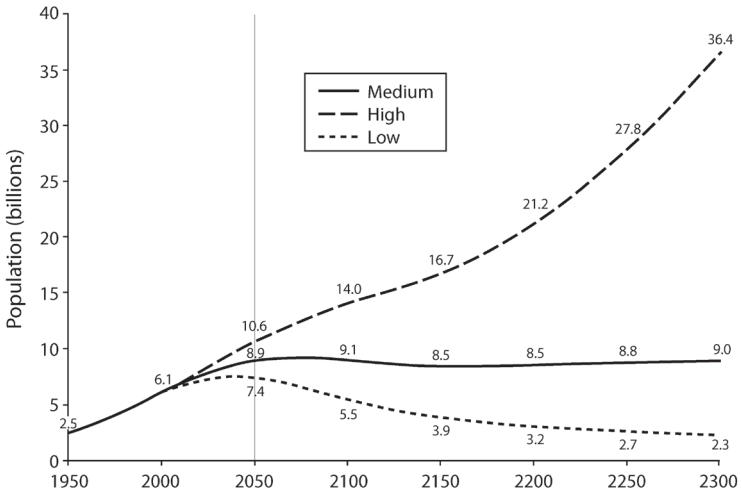
Personally I do not believe that we should think of people as costs that you have to decide whether you can afford, but I also believe that in some of the most inequitable of rich countries my way of thinking has become rarer. I would pay as much attention to the lower line in the first graph below as to the higher line. Note how the range for 2050 varies between 7.4 and 10.6 billion people. These were the estimates first made in 2003 and used in a second UN publication in 2004. The graph below that, from the most recent 2011 UN projection, shows how, just seven years later, the 2003/2004 figures were considered grossly out of date. John Wilmoth was sensible to call the first set of figures guesses and his comment on them ‘careful speculations’. But could they have been better guesses than what came after?

By 2011, the UN were no longer projecting forward 300 years. Instead they went no further than the year 2100, and all their projections were higher. The second graph in the Figure below shows the most recent 2011 update. At first glance it is as if some pressure group had got to the demographers, a group who believed that the demographers were not sufficiently alarming people and that the numbers needed to be larger.

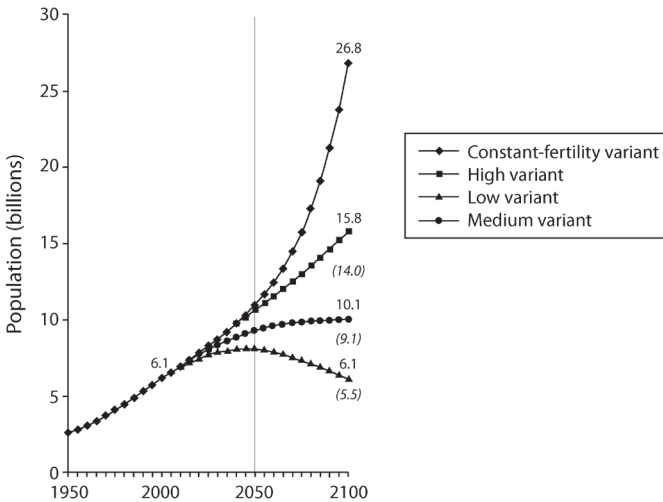
In this graph, the old estimates are shown in parentheses under the new. To the ‘low variant’ estimate were added an extra 600 million people by 2100, to the medium variant an extra billion (hence this book’s title), into the high

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UN Population Projections



Estimated world population: 1950–2000, and projections: 2000–2300, UN revision, 2004.



UN revision to 2000–2100 projections, 1 June 2011 (previous estimates in brackets).

variant total an extra 1.8 billion, and then they even added a new fourth line, the so-called 'constant fertility variant', which has the world human population reaching 26.8 billion within less than 90 years from now if, for some reason, we all suddenly revert to breeding rapidly again.

The renewed fertility spurt would have to be for a reason which did not itself result in rapid population decline, so it can't be following the advent of a new Stone Age precipitated by global nuclear war. Maybe everyone suddenly becomes very religious, but not abstentious, and chooses those religions that claim it is a sin to use contraception. I know that this is silly, but you try and think of a plausible new high-fertility scenario.

One reason that the official estimates now end in the year 2100 is that if you were to take them any further forward, the extremes become ridiculous. The constant-fertility assumption soon sees the planet overrun with humans breeding in the way we think rabbits do.

I'll say more a little later about what could have occurred to revise these projected trends upwards, and about how rabbits actually do breed. Here it is worth reflecting on the shock of those who saw just how rosy the possible future appeared to be when they were confronted with the above Figure's lower diagram after having got used to the upper one for seven years.

If you want to know what was behind the sudden upsurge in the gnashing of teeth over future population numbers, it was someone altering a few of the parameters on the world's population forecasting model, and they did that because of some news from somewhere like the County of Keck. That was when the machine in the Plexiglas dome (the one which listens and looks into everyone's home) found a few more (small) people.

The demographically experienced were, of course, not

shocked. One eminent commentator, Michael Teitelbaum, had counselled in 2004 against even including the figures for the so-called ‘constant scenario’ in the original report, let alone graphing such impossibilities: ‘Another unintended effect of including the “constant” scenario in the tables is to trivialize what would otherwise be very significant differences among the other scenario outcomes.’³⁹ Note that the ‘constant’ scenarios are not included in the related figures, perhaps for this same reason. But also note that for some (other) reason, the result of that ‘no-slow-down constant fertility scenario’ was included by 2011.

So, something changed between 2004 and 2011 to make the UN demographers behave in a way that just seven years earlier had been described as trivializing the issues. It was partly due to the fact that a few more babies were born than had been projected worldwide, as far as we can count them. Towards the end of this book, I’ll argue that it was not realized that these additional births were part of a mini global baby boom – echoing earlier larger booms. But that was not the main reason why the 2011 projections were drawn higher.

I think the UN forecasts were increased because it became more politically expedient to increase them, to appear to be warning that the numbers of people might be getting out of control. Even the numbers of population projections themselves were expanding in size over time. Would someone next project forward the projections assuming they would always underestimate and come up with an estimate of an even higher number of billions?

The main reason for the scare stories of 2011 and 2012 was that some demographers had been influenced by those with other agendas, people who were becoming interested in demography because they believed there were too many people already. Projections that indicate a ‘soft landing’ of

human population growth do not help the agenda of those who want to cry wolf. As the world economy faltered in 2008, there were groups that wanted to put the blame for the fact that there would be too little to go round in future on there being too many people, rather than not enough sharing.

Other interpretations are rare, but some do place emphasis on the UN tendency towards overestimation. Discussing Muslim majority areas, but applicable more widely, researchers in 2011 pointed out that ‘In its 2000 revisions of World Population Prospects, UNPD [UN Population Division] medium variant projections envisaged a population for Yemen of 102 million people; in its 2010 revisions, the 2050 medium variant projection for Yemen is 62 million.’⁴⁰ (United States Census Bureau projections for Yemen for 2050 as I write this are even lower: under 48 million.) Unanticipated but extremely rapid fertility declines would likewise militate for downward revisions in the trajectory of future demographic growth. So why is there not a UNPD or USCB scenario for the possibility of more rapid fertility falls?

There is no ‘extremely low fertility variant’ on either of the two graphs in the Figure drawn above. This would be a variant that shows what would happen if the current trends in places like Germany, Italy, Japan, Macao, Hong Kong and Singapore were to spread. No such scenario is presented because there is no global lobby worried about rapid population falls in the near future. If there were, then those lines would come to appear on the graphs. The reason we don’t have such a lobby is that most people who can imagine such falls also don’t imagine that they would necessarily create any great problems for humanity.

Researchers who think that the slowdown could happen faster than predicted tend not to be worriers. These

are people who look at fertility rates of around only one child per couple in Hong Kong, Singapore and Macao and wonder why we don't produce a projection assuming that such behaviour could spread more quickly than is currently thought likely. However, these researchers also often don't see particularly high or particularly low population numbers as being a problem in their own right, as neither do they consider an especially young or ageing population as necessarily problematic. Nevertheless, it does help to have some idea as to how many people there will be both soon and in the distant future. That is why the 2003/2004 UN revision was so good.

The 2004 revision and its 2003 pre-release was a great improvement on earlier UN work. Its publication reduced many people's worries resulting from the earlier 1994 revision, one which had projected some 9.8 billion folk on the planet by 2050.⁴¹ When I first saw the 2003 report, I thought someone had made a mistake with the data; that they had put the '3' in the wrong place and it was a forecast for 2030. But I was wrong. It really did include projections forward to 2300. What's more, it wasn't just a forecast for the future population of the planet. It was a forecast for the geographical area of each country of the world between now and the start of the twenty-fourth century.

Too few people realize how volatile demographic projects are over time, or just how wide are the confidence limits around the estimates for any one time even in the near future. Prior to May 2011, the top demographic experts of the United Nations had suggested that world population would peak at 9.1 billion in 2100, and then fall to 8.5 billion by 2150. In contrast, the 2011 revision suggested that 9.1 billion would be achieved much earlier, maybe by 2050 or before, and by 2100 there would be 10.1 billion of us.

The new May 2011 projections implied that the global human population count might still be slightly rising a century from now. However, a billion or so people here or there is within the bounds of even the smallest of errors in all these models. A billion sounds a lot because we have got used to the term million, but not yet to the idea of a billion. It is not hard to make a billion sound small. It is 10 per cent of the currently projected 2100 world population. It is one extra, on average a fifth, grandchild for every second couple on earth.

The world did not react in horror when 10 billion humans were first predicted. Population forecasts are incredibly fickle things, and the long-term prognosis was still for stability. When the news came in from the County of Keck (or rather from Niger, or one of the more inequitable states of India) suggesting that a few more babies were being born than had previously been thought and a few less folk were dying, the machine in the Plexiglas dome was recalibrated. The button was pressed and the number that came out had eleven digits rather than ten.

The global human forecasts were not increased because the world was becoming a worse place to live. There were fewer wars, and that saved lives. Malaria was being tackled a little more effectively, and more people were being successfully treated for HIV/AIDS than had been the case to date. Most importantly, a few (million) more children had been born recently than had been expected. As suggested at the very start of this book, just a tiny change in fertility can be magnified in a century to an extra billion human beings. A tiny change in the other direction, and there'll be fewer than eight billion of us in the near future. And that is quite possible too, if not currently thought probable.

Yet with less war, fewer deaths from HIV/AIDS and malaria and a lower death rate of children overall, people

in future could have even fewer children than they are currently forecast to have. Wars tend to be followed by baby booms, and high infant deaths often result in high fertility to compensate; conversely stability breeds slowdown and yet more stability.

What difference would it make if world human population were to peak at 8 or 10 billion, or even a little lower or higher? Later on, this book suggests that what will matter most is how people behave, not their total numbers, and that many people are coming to understand that – which is why the news of an expected extra billion humans should not result in panic. But in some quarters, people think differently. They think warnings need to be issued. And indeed, some warnings do need issuing, but not about too many or too few people.

The projections to 2300 are more likely to be incorrect than shorter-term predictions simply because of the distance into the future and also for some practical reasons. Already some countries have split and others merged. In 2002, East Timor split from Indonesia. Montenegro and Serbia became separate states in 2008. Kosovo declared its independence the same year. As of 2011, there were two states in what was Sudan, one in the south and one in the north. Conveniently, both are still called Sudan. It is not inconceivable that most countries as we know them today will not exist in 300 years' time. Most did not exist 300 years ago as we know them today.

In general, the trend is for the number of states to grow over time. So the UN projections, called 'scenarios' in the 2003 report, are for areas which in many cases might be home to more than one country in future. Simultaneously, other areas will coalesce into what become, in effect, single economic or demographic blocks. The European Union, and especially the single-currency block within it, also

happens to be an area of remarkably low fertility by historic standards.

If I had to put money on any one projection, I would put it on the 2003/2004 central projection of the UN. This is because I think we are currently experiencing a small global baby boom, an echo of earlier larger booms, but projecting forward as if that boom is not going to end soon, as the 2011 report does, is foolhardy.

According to the 2003/2004 report, the one I would put most faith in, world population will rise from 6.1 billion people in 2000 to a maximum of 9.2 billion by 2075, and decline thereafter, as deaths exceed births, to reach 8.3 billion a century later, in 2175. After that, increased ageing will result in the population slowly climbing to 9 billion by 2300, despite fertility being at close to replacement level. This was, and remains, a very benign scenario. It predicts widespread worldwide ageing and, implicitly, narrowing future economic inequalities. It may not be like this, but it could be.

A variation on the central projection shows fertility rates worldwide falling below replacement rates after 2175, and the population remaining at 8.3 billion despite longevity increasing. There were, of course, many other scenarios offered. But the upper extreme that was being suggested – that world human population could be as high as 36.4 billion – would require a step change in human behaviour that is unlikely, a return to very high fertility. The low projection, that the population will be 2.3 billion by 2300, is possible to imagine. People may simply continue to choose to have fewer children. That is what they have been doing for almost three generations now, worldwide.

It is time we woke up to the change that is happening. One leading demographer in Australia, John Caldwell, reached this point almost a decade ago. Among the high

scenarios, the one 'showing population reaching 36 billion in 2300 is almost certainly irrelevant. The high fertility path is unlikely to be followed short of a nuclear war decimating the human race.⁷⁴² But why do all these projections vary so much? Surely demographers can do a better job of predicting the future than this? Before we get to what else the UN reports suggest, and what others say of them, it might be a good time to introduce Mr Fibonacci and his rabbits to try to explain why we find it so hard to project with much certainty.

Fibonacci's rabbits

The number of children is not growing any longer in the world. We are still debating peak oil, but we have definitely reached peak child.

Hans Rosling, TED talk, 2012⁴³

Leonardo Fibonacci was born in the twelfth century. This son of a merchant from Pisa grew up in what is now Algeria, but travelled widely, so widely in fact that he learnt about using Arabic numerals before many others in the Christian world did. He is best known because his name is given to the numbering sequence by which rabbit populations, without hindrance, might grow. Like much else that people think was discovered in Christendom, or even in the more numerically enlightened Arab world, this sequence had in fact been known since the sixth century in what today we call the Indian subcontinent. Fibonacci used the sequence to show the advantages of the Hindu-Arabic numeral system. It is not hard to see why that numbering system won out in the long term if you try to work out his series using only Roman numerals.