SPRING BOOKS

CLIMATE ECONOMICS

The high road

Michael Grubb is both swept away and frustrated by Nicholas Stern's argument for tackling climate change.

Nicholas Stern's *Why Are We Waiting?* is an important but frustrating book. It is important because it embodies the thinking of probably the most influential person at the nexus of climate change, economics and international policy. It is frustrating because it does not answer the titular question. It presents compelling economic logic for urgent action on climate change, but fails to get to the heart of what stands in the way.

Stern, who was chief economist at the World Bank in the early 2000s, produced the hugely influential 2006 *Stern Review on the Economics of Climate Change* while head of the UK Government Economic Service. A crucial achievement of the report was Stern's framework, which bridged 15 years of apparent impasses between the dominant scientific and economic perspectives. It offered a cost-benefit structure that agreed with the scientists, that strong action was needed to counter anthropogenic global warming. It ignited debate on climate change throughout the economics community, which until then had considered the subject of marginal interest. Nine years on, Stern concludes in *Why Are*

We Waiting? that the case for action is now even more urgent.

The book is astonishingly broad in scope and vision. Its core argument is that the next two decades will be decisive, as a critical period for emissions coincides with massive structural change in the world economy. These are conjoined challenges, and Stern has long argued that "high-carbon growth is likely to self-destruct". How the economic changes are channelled will determine the choice "between peril and prosperity".

Stern's coverage of the science is taut and displays his eye for relevant dimensions of the big picture, linked to human realities. He writes, for instance, that unchecked greenhouse-gas emissions are likely to cause carbon dioxide concentrations to reach 750 parts per million of the atmosphere by 2100, resulting

Why Are We Waiting?: The Logic, Urgency, and Promise of Tackling Climate Change
NICHOLAS STERN
MIT Press: 2015.

in a median temperature increase of 4°C or more above preindustrial levels, which would transform Earth's "physical and human geography". So "deserts, coastlines, rivers, rainfall patterns — the reasons we live where we do — would be redrawn". *Homo sapiens*, he says, "has not experienced anything like this". Stern notes that the uneven distribution of temperature increases could "correspond to average land temperatures as much as 4–10°C above the preindustrial", and could trigger frequent summer heatwaves as severe as the Russian disaster of 2010, which killed 55,000 people.

Stern endorses the goal of checking emissions by enough to allow a 50:50 chance of staying below a 2°C increase, but the window for that is closing rapidly. Far from being a burden justified by the risks, however, he sees the endeavour as "very attractive". The centrepiece of his argument — drawing heavily on last year's New Climate Economy report, which he co-chaired — is the potential for a tsunami of innovation to engulf the fossil-fuel economy, galvanizing economic growth.

However, Stern does not adequately delve into the fact that too much analysis, modelling and policy is still dominated by the idea that there is a natural 'least-cost' energy system, and that market forces would deliver it if we only corrected market failures. This reflects the inbuilt assumptions of neoclassical economics. But the broad sweep of economic processes and thought spans at least two other domains. One concerns the behavioural and organizational realities that underpin the huge potential to improve energy efficiency, and other 'easy wins'. The other is evolutionary economics: understanding how complex

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systems evolve and can be locked into trajectories by incumbent industries, unless strong pressures force a change in course. These strands of economics are crucial to understanding the energy–climate nexus and policies for transformation. The economics mainstream is still largely in thrall to the idea that competitive markets drive innovation, but liberalization of the energy sector destroyed UK energy research and development. The energy literature explains why, but Stern hardly touches on this and thus misses a chance to help to educate fellow economists.

Stern's real speciality is displayed most in his discussion of the ethics of how to weigh costs and benefits over time, as well as broader issues in moral and political philosophy. The first is technical, but is at the heart of the post-Stern review debate: prevalent economic tools 'discount' almost anything more than a few decades ahead. Critics often cite philosopher David Hume to support arguments that we should weight impacts on future generations on the basis of 'revealed preference' in markets. To these critics, Stern cites Hume on the need for "governors and rulers" to overcome the "impatience" of individuals. Stern maps out his case with a precision reminiscent of philosopher and mathematician Bertrand Russell. He demolishes economists who, trying to avoid explicit ethical debates, forget the ethical assumptions of their discipline.

Towards the end, Stern distils his thoughts on the international climate scene. Although he overlooks some key respects in which a binding treaty — the Kyoto Protocol — was crucial in forming European climate policy,

huge value remains in his wisdom and his experience of international debates.

However, Stern's coverage of lessons from economic history and theory is messier. It meanders through market failures, policy uncertainties, the European Union's emissions-trading system, the debate over reserves of fossil fuels that must be left unburnt to satisfy emissions targets, shale gas, the German nuclear phase-out, failed Chinese dams and more. There are trenchant points about six market failures and the six areas of policy required to address them, but little structure behind the tales, and no compelling narrative on how policy failures might have been overcome. Instead, Stern embarks on a demolition of his critics. The integrated assessment models beloved of many technical analysts come in for particular ire. Stern views them as "simplistic attempts to shoehorn the deep and dynamic issues into inappropriate or narrow models", noting that many "can be profoundly misleading", and evoking John Maynard Keynes' old punchline: "It is better to be roughly right than precisely wrong."

Most seriously, Stern has misdiagnosed the major obstacles to climate action as a failure of policy-makers to understand the scale of the risks, to grasp that delay is dangerous or to appreciate the feasibility of and potential for low-carbon paths. These are not the root of the problem, and Stern never gets to it, despite providing much of the intellectual material.

Most policy-makers accept the need for action. Ignorance, inattention and ideology have all played a part in the waiting game, but it also springs from microrealities of politics

and economics. Stern is a big thinker, used to the broad sweeps of economic development and global issues. But the crux is local people and businesses. Voters might like the idea of clean energy, but oppose wind farms next door; back emission reductions and profess support for market-based solutions, but oppose increased energy prices. There is little on energy prices in *Why Are We Waiting?*, but climate policy in Brussels and Washington DC is concerned with little else.

The real challenge in controlling climate change is many-layered, but must include attempts to align global need for transformation with the old adage that all politics is local. A brief reference to border measures, to deter industries from migrating to escape carbon controls, signals a shift in Stern's thinking; but the argument is not developed further.

Stern deserves much credit for moving the economics debate on so far in a decade. But *Why Are We Waiting?* is a depressing reminder of the sheer size of the elephant. The complexities of climate change are beyond the ken of any individual, even such a big thinker as Stern. Developing the institutions, intellectual frameworks and impact channels required for effective 'solution science', matched to the sheer range and scale of the problems and opportunities, remains very much a work in progress. ■

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GENETICS

We are the 98%

Nathaniel Comfort unpicks the metaphors in a trio of books exploring the 'junk'–ridden genome.

The language of DNA is a veritable cornucopia of metaphor and cliché. Since James Watson and Francis Crick solved the double helix, biologists have imagined DNA as an information-storage device: magnetic tape, a computer program or, most commonly, a book that contains the instructions for making a cell's proteins. In multicellular organisms, this precious tome is secured in the vault of the nucleus, the membrane of which isolates and protects nature from nurture.

But if a genome is text, it is badly edited. Most DNA is gibberish, full of stutters, snippets of doggerel from other species, and echoes of quiescent viruses. In humans, only

about 2% of the genome encodes proteins. Much — but not all — of the remaining 98% is evolutionary detritus. In the 1960s, researchers learned that non-coding DNA can serve vital functions, such as regulating gene action and building ribosomes. The remainder they began to call junk.

Today, junk DNA is at the heart of the most radical transformation of how we understand the genome since the information metaphor. Three books — *The Deeper Genome* by John Parrington, *Junk DNA* by Nessa Carey and *Biocode* by Dawn Field and Neil Davies — present a vision of the twenty-first-century genome. Their relative success hinges on metaphor and imagery, both in how they

Biocode: The New Age of Genomics

DAWN FIELD AND NEIL DAVIES
Oxford Univ. Press: 2015.

The Deeper Genome: Why There Is More to the Human Genome Than Meets the Eye

JOHN PARRINGTON
Oxford Univ. Press: 2015.

Junk DNA: A Journey Through the Dark Matter of the Genome

NESSA CAREY
Icon: 2015.

conceive the genome and in the writing itself.

In September 2012, the ENCODE (Encyclopedia of DNA Elements) consortium announced that its multi-year international effort to catalogue the various types of DNA sequence had assigned "biochemical function" to 80% of the human genome. Incautious reporters began shouting that junk was bunk, even though scientific consensus maintains that most genomes contain large amounts of it. The subsequent debate upregulated public interest in non-coding DNA — but how do we talk about DNA now?

The title *Biocode* forestalls any doubt ►