Oliver Morton, *The Planet Remade: How Geoengineering Could Change the World.* London: Granta, 2015

Until very recently, geo-engineering was a subject calculated to elicit sneers from environmental scholars and activists alike: at best, a source of frenetic moral anxiety from those who believe these technologies will reduce the political will for carbon reduction initiatives, at worst, the bugbear of chemtrail/contrail conspiracy theorists who imagine that secret governments programmes are already engaged in solar radiation management. Over the last three years, that has changed. The Paris Agreements, with their provisions for 'negative emissions technologies' have virtually ensured geo-engineering a place in mainstream policy discussions of how to most effectively manage climate change.

Where should scholars and practitioners of environmental law go to get up to speed on subject? They could do much worse than to start with Oliver Morton's readable offering, which has been shortlisted for Royal Society Insight Investment Science Book Prize for 2016. Morton, a professional journalist who cut his teeth as chief news and features editor of *Nature*, has since 2009 been briefings editor for *The Economist*. His audience is similar: educated lay readers, those who appreciate a discussion of the technical details, but are more concerned with the political challenges and policy implications.

As the introduction makes clear, this is a book for grown-ups: those who understand that climate change is a serious existential threat, while simultaneously recognising that the transition to zero carbon-dioxide emissions is very difficult indeed. If you deny the reality of climate change and/or fantasize that reducing carbon emissions is trivial, this is not the book for you.

For those who are interested in Morton's arguments, *The Planet Remade* is impressive in its intellectual breadth and sense of adventure. The effect is part a sweeping intellectual and institutional history of climate science in general and geo-engineering in particular, part an attempt to convey the exciting possibilities of the technologies, and part a memoir of the author's own discovery of his subject and the evolution of his thinking about the possible futures therein.

The text is divided into three parts. Part One, 'Energies', sets the stage. Chapters 1 and 2 provide engaging treatments of the discovery of the stratosphere and the ozone layer, and the birth of climate science. Chapter 3 considers the Pinatubo eruption in the Philippines in 1991 as a potential aerosol-cooling prototype. The analogy between volcanology and solar radiation management is especially helpful in giving lay audiences a sense for the scale involved. Chapter 4 explains the current state of the science behind stratospheric aerosol injection (SAI), while Chapters 5 and 6 offer a fair-minded presentation and appraisal of the caveats, the risks, and the reasons why geo-engineering remains so politically contentious.

Part Two, 'Substances', engages more directly with the science. In Chapter 7, Morton investigates non-climate geo-engineering in the form of human manipulation of the nitrogen cycle, without which humanity would be unable to feed itself. Chapter 8 explores what is known about human contributions to fluctuating carbon dioxide levels. Chapter 9 wonders if the Anthropocene has already produced a post-glacial

epoch, while also elaborating in detail the mechanics of carbon capture and sequestration (CCS) technologies. Chapter 10 returns to the possibilities of solar radiation management, especially sulphuric aerosol injection and space mirrors, to weigh up the risks and potential benefits.

Part Three, 'Possibilities', begins in Chapter 11 by reminding us that apocalyptic climate scenarios are nothing new. Nuclear Winter was an omnipresent worry in the 1980s. In very broad brushstrokes, Morton offers an intellectual history from Huxley, to H.G. Wells, John von Neumann, Gene Shoemaker, Luis Alvarez and Carl Sagan. The effect is dizzying and almost lyrical. Chapter 12 ends with a more sober assessment of the case for geo-engineering. Morton concludes on a cautious but optimistic note: he believes that humanity can grow the institutions of governance and create the politics needed for intentional modification of the climate system to have a place in human stewardship of the planet. Not everyone will agree, but even those who object violently to his conclusions should find *The Planet Remade* a thought-provoking read.

*The Planet Remade*, however, is not an academic book. There is a bibliography, which is largely confined to literature actually cited in the text. Scholars working in the area will find it of limited use. Morton wears his considerable learning lightly. Each chapter is a mini-essay, more in the style of John McPhee's *The Control of Nature* than a journal article. This reviewer would be unsurprised if a documentary film were to follow, as the style lends itself to that format. As with all good documentaries, the aim is primarily educative and consciousness-raising, positing many questions, and few concrete answers, along the way. The Paris Agreements have made negative emissions technologies a political reality, Oliver Morton has offered an extended meditation on what that reality will look like.

As this is the one book that most people will read about geo-engineering, The *Planet Remade* will prove influential in shaping public debate. That alone is reason not to ignore it. For the readers of the *Environmental Law Review*, there are additional reasons to obtain a copy. Morton offers legal scholars and intellectual historians of science numerous historical precedents for climate-based geo-engineering, even if they are not explicitly enumerated as such. He also sketches the legal and political challenges, alongside the scientific and technological hurdles, but does not offer specific solutions. Those are exercises he leaves to others, but they are crucial considerations all the same. Many of us will spend a large part of the next thirty years engaged with the very issues that Oliver Morton has so eloquently raised.

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