

# BOOKS & ARTS

## Lessons in carbon trading

The most extensive evaluation to date finds that the European Union Emissions Trading Scheme is robust and successfully cut the region's emissions in its first three years, explains **Michael Grubb**.

### Pricing Carbon: The European Union Emissions Trading Scheme

by A. Denny Ellerman, Frank J. Convery, Christian de Perthuis and contributors  
Cambridge University Press: 2010. 390 pp.  
\$59, £35

*Pricing Carbon* is a long-awaited analysis of the first major attempt to set a price on carbon emissions through the European Union Emissions Trading Scheme (EU ETS). With its empirical focus, this myth-busting book demonstrates the scheme's achievements and flags its ongoing challenges. These are set out in careful studies by international experts in energy policy and environmental economics, including primary authors Denny Ellerman, Frank Convery and Christian de Perthuis.

The book centres on the first phase of the EU ETS that ran in 2005–07. It explains how the scheme was set up to place a price on carbon by capping carbon dioxide emissions, thus demonstrating a key mechanism in market-based economies. Previous attempts in the early 1990s to implement carbon or energy taxation in both the EU and the United States crashed. Thus when the EU tried again a decade later, it borrowed from the cap-and-trade system that was used successfully to control sulphur emissions set by the US Clean Air Act. The resulting EU ETS dwarfs all other similar developments. It introduced a legally binding CO<sub>2</sub> cap covering almost half of the emissions from 27 European countries (30 are included in the scheme today) and more than half a billion people. It is also the lynchpin of the Kyoto system of emissions control. As such, the EU ETS has become a political football.

The way in which carbon-trading allowances were allocated remains the most contentious issue. The scheme's first phase ended with a carbon price that fell to zero when it emerged that the number of allowances handed out — almost all for free — exceeded actual emissions (see 'EU carbon futures'). *Pricing Carbon* dispatches the widespread assumption that this surplus of allocations implies that the scheme has not cut emissions. The book estimates that the EU ETS saved 120 million to 300 million tonnes of CO<sub>2</sub> over those three years — an overall reduction in emissions of up to 5%. Crucially, big savings were made in emissions from both the industrial and energy sectors.



Capping CO<sub>2</sub> emissions places a price on carbon.

In Germany, a 6% cut in CO<sub>2</sub> emissions was achieved across both sectors, demonstrating that emissions can be reduced even in one of Europe's most efficient industrial countries.

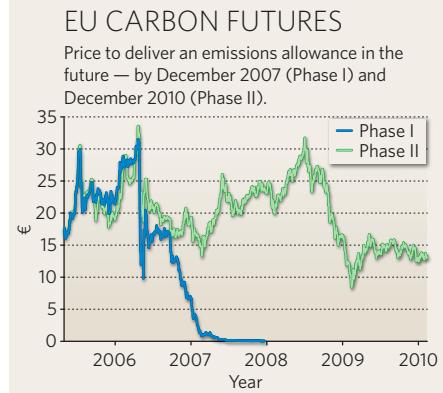
The book's analysis of trading patterns also shows the impact of the scheme on emissions reduction. Irrespective of the initial spread of endowments produced by the politics of permit allocation, the freedom to trade resulted in a more efficient final distribution of emissions abatement, as intended. Those with insufficient allowances reduced their emissions to minimize the cost of buying more, while many of those holding extra ones still cut their emissions with the expectation of being able to sell the excess. All had to monitor and forecast their emissions, and some of the changed patterns of behaviour and investment persisted even after the price itself had collapsed.

However, there is a gap here in the book's discussion. I have argued elsewhere (M. Grubb

and F. Ferrario *Climate Policy* 6, 495–501; 2006) that there is an intrinsic risk in trading systems of giving away too many emission allowances. This is suggested by four pieces of evidence: a historical tendency to inflate projections of industrial emissions; the inherent advantages that industry has in the bargaining process; past experience in setting industry emission targets; and the accumulating history of cap-and-trade allocations. It is a pity that the book doesn't examine the nature and cause of the first-phase permit surplus more closely — although it is comforting to find that it didn't matter as much as common sense would suggest.

The chapters on industrial competitiveness and costs are an eye-opener to those expecting dire news. Adverse economic effects have been "imperceptible", according to the authors, amounting to around a hundredth of a per cent of gross domestic product (GDP). Because only the most energy-intensive sectors were likely to be affected by the scheme, and these contribute a tiny part of the GDP of industrialized countries, such a benign outcome might have been anticipated. Nevertheless, profuse emitters such as the cement, steel, aluminium and refining industries wield a lot of political power, and their acceptance of the scheme is important for its success. In the end, most of these industries gained from the system by passing on the cost of carbon, and by selling allowances generated from both their initial surplus and an actual reduction in emissions.

The book says little explicitly about the ongoing debate over whether tax or trading is the best way to curb emissions. The authors simply insist on the political and distributional realities that favour an evolutionary trading approach, in which the level of free allocation can be reduced in each phase, pointing out that "there would have been no EU ETS unless allowances in the trial period had been allocated for free". It would have been interesting if they had elaborated on the reasons and implications for this more fully. Because carbon taxation both sets a price and transfers vast amounts of money from powerful industries to governments, the political obstacles to this transfer of money have always stymied attempts to generate a carbon price through taxes. In emissions trading, by contrast, it is the free allocation of allowances that gives the extra liberty needed to jointly solve the problem of setting a price and handling the distributional consequences.



The strength of *Pricing Carbon* is also its weakness. The authors are so keen on the empirical focus that they largely eschew judgement, even as to whether the system has been a success. Nonetheless, the book is suffused with the sentiment that establishing a credible cap and price on CO<sub>2</sub> emissions on a grand scale is a triumph of policy, one that is still a world first after more than five years. I agree that it is a huge feat. The EU got many crucial things right: the basic market design; the focus on well-monitored, sizeable point-source emissions; and the sequential phases that have

allowed the system to develop and improve.

The world's greatest experiment in carbon pricing is not out of the woods yet. Although the system will continue, with major design features agreed up to 2020, countries are still embroiled in battles over how to allocate allowances. The current modest carbon price will not support new low-carbon investments, and the establishment of tougher rules could risk driving established industries to non-EU countries. Hopes that other regions will develop similar schemes, laying the basis for a more coherent global response to emissions, are

currently taking a battering. The EU regards its emissions scheme as the flagship, but there is little sign of an international fleet. Even so, for those who want to learn the real lessons of the EU ETS experience, there is no better source than *Pricing Carbon*. ■

**Michael Grubb** is a visiting professor at Imperial College London and a senior research associate in the Faculty of Economics, University of Cambridge, Cambridge CB3 0DD, UK. He is editor-in-chief of the journal *Climate Policy* and author of *The Kyoto Protocol: A Guide and Assessment*. e-mail: michael.grubb@econ.cam.ac.uk

## Predicting human activity

### Bursts: The Hidden Pattern Behind Everything We Do

by Albert-László Barabási  
Dutton: 2010. 310 pp. \$26.95

We usually assume that we do things for a reason, whether we are obeying the dictates of the unconscious, rational self-interest or our genetic predisposition. Yet such determinism cannot predict the diverse range of human behaviour. We are left to suspect that our actions may be no more patterned than coin-tossing.

In *Bursts*, physicist Albert-László Barabási explains how this notion of randomness has been undermined by recent research, including his own. We conduct our affairs in bursts, he says: for example, sending out several e-mails in a short space of time and then none for hours, or pottering around our neighbourhood and then travelling 1,000 miles.

Barabási explains that we organize tasks in bursts because we prioritize them, attending to each on a timescale that is appropriate to its urgency.

Even our everyday wrist movements, when monitored with accelerometers, show bursts of motion that are interspersed with periods of repose. As a team at the University of Tokyo has found, the distribution of these bursts differs for people who are clinically depressed, suggesting that such statistics might offer a diagnostic tool.

The book is replete with human stories

that animate what might otherwise seem a dry account of statistical patterns. Barabási describes Albert Einstein unwittingly stalling the career of fellow physicist Theodor Kaluza by taking two years to reply to a letter, and the US-based artist Hasan Elahi being questioned by the FBI because of his 'suspicious' travel patterns. After his interview, Elahi set up a public website to record his movements as an art project. It revealed that Elahi's globetrotting was genuinely anomalous. An algorithm developed by Barabási was able to forecast the move-

assertion that the prediction of most things we do at the individual level "is growing increasingly feasible" is not persuasive. Our predictability, to the extent that our choices and movements form a pattern, relies more on extrapolation of past behaviour — as exploited by web-based 'recommender systems' that draw on our purchase or browsing history — than on burst characteristics. Similar to avalanches and earthquakes, bursts have statistical orderliness but remain unpredictable as individual events.

The underlying origin of 'burstiness' is unknown. These intense periods of activity are not a by-product of advanced cognition because they apply beyond human behaviour — to the different foraging patterns of animals, the transcriptional activity of genes, and evolutionary speciation, for example. But Barabási cannot say whether their ubiquity stems from the same cause or whether bursts are merely a statistical signature, like power laws or fractals, that many different mechanisms can generate.

Barabási punctuates his exposition with the tale of the 1514 peasant revolt in Hungary, led by his compatriot György Székely. This story supposedly illustrates the difficulty of predicting human affairs, but one could make that point using most episodes in history, and the link to bursts is tenuous. I was happy to indulge him in this digression; others might not, but I encourage them to try, because *Bursts* reveals Barabási to be both an inventive, interdisciplinary scientist and a talented communicator. ■

**Philip Ball** is a writer based in London and the author of *Critical Mass: How One Thing Leads to Another*. His latest book is *The Music Instinct*.



Artist Hasan Elahi now charts his random travel patterns after US authorities questioned them.

ments of anonymous individuals by combining information about their locations, as revealed by mobile-phone use, with their personal pattern of 'bursty' movements between locations. It was more than 80% accurate for everyone except Elahi, whose movements were unique in that they were truly random.

Barabási's success in predicting human mobility patterns from mobile-phone data leads to his plausible, if ominous, suggestion that individuals could be constantly tracked using such techniques coupled with widespread surveillance technologies. Yet his