misleading us or deluding themselves?

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Natural Capitalism - the next industrial revolution.

Paul Hawken, Amory B Lovins, L.Hunter Lovins
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According to the authors, David Brower, the American environmentalist and mountaineer, once proposed a user's manual for those buying an Earth. 'This planet has been delivered in perfect working condition, and cannot be replaced. Please don't adjust the thermostat or the atmosphere'. Those of us who do our environmental and resource sums know our Earth cannot continue along its present path of wasteful growth. This book lays out the upcoming problems in simple, accessible language. But so do many others. The difference is the claim that solutions are round the corner if we but adopt what the authors call 'Natural Capitalism' - '*the next industrial revolution*'. The question is whether this vision is real or imaginary.

This stimulating, informative and visionary book should be widely read. Regretfully, however, their faith in technology and social engineering should be taken with a pinch of salt, if not indeed with a health warning. The Lovins' (husband and ex-wife), if not co-author Paul Hawken, are well known for the optimism with which they propound solutions to environmental and resource issues. No one is more welcome at business seminars on the environment. They are Pangloss to Rabelais' cynicism.

The book is a vast, well-documented tapestry of anecdotes of how more service can be (or could be) got from less materials and energy. Like the star-studded night sky the book is a constellation of options that twinkle beguilingly at the reader, beautiful to behold, but without a clear structure. Much of the thesis in this book has already been expounded in an earlier work, *Factor Four*, written with Ernst von Weizsacher of the Wuppertal Institute in Germany.

In *Natural Capitalism* the authors expand the range of anecdotal information, gloss them with science, and extrapolate diminishing dollar costs into the distant future. In this rosy future there will be so much energy saving that oil will scarcely sell for $5 a barrel. To arrive at this sate of affairs they make some heroic assumptions, and incur some thermodynamic howlers. How is the reader to interpret hyperbole like '*92% less energy use* ' or '*100% saving*', or the claim that electricity from photo-voltaic devices is of *'higher quality'* (p97), or that *'combined cycle gas turbines are not subject to Carnot's Law*', or phrases like *'useful work extracted ... to more than 90% of the original fuel energy'*? One should not lightly buck the second law of thermodynamics, for no-one has yet succeeded. Amory Lovins has a degree in physics. He should know better.

Their technique is simple. Some recent technological developments are reported which can cut the energy and materials needs by (say) half. Then new ways of doing things can cut the need for that energy by a further half (half of a half equals a quarter), then, since we have cut some inputs to a quarter, other economies follow in their train. This a very dangerous argument. Here is a quote from page 244:

> Over the next half-century, even if global economy expanded by 6 - 8 fold, the rate of releasing carbon by burning of fossil fuels could simultaneously decrease by anywhere from one third to nine-tenths below current rate. This is because of the multiplicative effect of four kinds of actions. Switching to natural gas and renewable energy, as fast as Shell Oil planners consider likely, would cut by one half to three quarters the fossil-fuel carbon in each unit of energy consumed.

They continue: 'The efficiency of converting that energy into delivered forms, notably electricity, could meanwhile rise by at least half, thanks to modern power plants and recapturing waste heat. The efficiency of converting delivered energy into desired services would also increase by about 4-6 fold' (Why?, How?) '. 'Finally the amount of satisfaction derived from each unit of energy might perhaps be doubled by delivering higher-quality services and fewer unwanted ones.'

The allure of this argument is indeed compelling for it banishes the doom and gloom merchants to their dismal cellars; but it is misleading, for there is one thing they have over-looked: human greed. The evidence is that when you get more from less, you just take advantage of the slack. Economists call this the 'rebound effect', and it is well documented. Is it significant that neither 'rebound effect' nor 'thermodynamics' appear in the index of a book that is astonishingly rich in allusions to energy?

This critique may seem churlish when the environmental problem is so well put and where there are undeniable options for better material and energy use and waste recycle. Are the authors simply deceiving themselves? I think so, and in two ways. Firstly by using monetary measures to extrapolate into the future. Money is an abstraction that does not lend itself to longer term mensuration. Secondly, every single energy- and materials-reducing possibility impacts on the entire economy somewhere, somehow. These options needed to be tested through the medium of a holistic physically-based model of the economy. Only in this way can we get a feeling for the extent of the possibilities. Just to give an example: this reviewer was one of team developing such a model for the European Union in concert with members of the Wuppertal Institute who espoused not merely factor four but factor ten. However hard we tried, using their data, we could never achieve more than about a factor two reduction in input per unit output.

Let me close on some of the best aspects of this book. The authors offer an excellent critique of market and economic theory. The chapter ‘Making Markets Work’ lists 18 assumptions implicit in the theory of perfect markets, the cornerstone of economic modelling (p263). They deftly destroy them on the following page. They make a good argument for transferring taxes from labour to resources. It is a pity they don’t record the pioneer work done here by the English engineer, Farel Bradbury, who invented the name UNITAX for this proposition, and who has led thinking in this area for the last twenty years.

The authors make the important point that economics does not and cannot value natural capital. But unfortunately they side-step the resolution of this important issue. 'It is not the aim of this book to assess how to determine value for such unaccounted-for forms of capital. It is clear, however, that behaving as though they were valueless has brought us to the verge of disaster.. ....Capitalism as practised, is a financially profitable, unsustainable aberration of human development. What might be called 'industrial capitalism’ does not fully conform to its own accounting principles. It liquidates capital and calls it income. It neglects to assign any value to the largest stocks of capital it employs - natural resources...' We can but agree.

Their preface states: 'We believe the world stands at the threshold of basic changes in the conditions of business. Companies that ignore the message of natural capitalism do so at their peril....(We) show that the move towards radical resource productivity and natural capitalism is beginning to feel inevitable rather than merely possible.... If at times we lean more to enthusiasm than reportage, it is because we can see the tremendous array of possibilities for healing the most intransigent problems of our time'.

Well, this trend is inevitable, but let’s be realistic about it.

Malcolm Slesser is the author of several books on environment, development and resources. He is the architect of the Natural Capital Accounting approach to macro-economic scenario analysis . He trained as a chemical engineer and set up the Energy Studies unit at the University of Strathclyde and became its first professor. He lives in Edinburgh.

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