



Review

Closing the gap between energy research and modelling, the social sciences, and modern realities



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ABSTRACT

Disregard or ignorance of history, the overlooking of energy issues in standard economic growth theory, and failure to recognise the role which declining marginal returns on energy exploitation has played in the decline of earlier complex societies, are evident in academic and more general discourse. Excessive resort to equations, modelling, and standard economic theories, have instead clouded imagination and focus on reality, while hindering focus on complicating factors as we consider future possibilities. This paper provides an overview of these issues and their potential implications now and for the future.

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1. Introduction

In human actions, academic discourse, and media coverage ignorance of history, disregard of history, selectivity in the choice of historical material where used, and failures to check historical facts where possible, have long been apparent.

This state of affairs is clearly evidenced in energy research and policy, and the forces underlying the latter. Mainstream economic growth theory has tended to overlook energy issues completely in

favour of asserting that labour and capital are the only two factors of production. There is a widespread disregard for the role which declining marginal returns on energy production have played in the decline and collapse of complex societies in the past. Concepts fundamental to the usefulness of different forms of energy are regularly overlooked. Several core examples are fundamentally irrefutable, as the works of Ted Trainer, Charles Hall and Kent Klitgaard, and others have pointed out [1]. The challenges to the future of the human race embodied in growing world population, and limited resources, find many in a state of denial.

The exploitation of fossil fuels, and efforts to expand the availability of low carbon energy technologies, are seen by an increasing number of observers to place the “great acceleration” of economic

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growth and material living standards under fundamental pressure. Some consider that the resulting pressures put what has been called the Anthropocene Age – variously claimed to have begun with Francis Bacon, Thomas Newcomen, or simply “the 1800s” – under terminal threat.

Lying behind the ideas and evidence presented in this paper is the view that so complex, uncertain and incomplete a set of future possibilities cannot usefully be handled by seeking to model them. Modelling specific aspects – the estimated future supply and use of conventional oil resources, for example – may help assess future challenges and underpin aspects of the scenarios developed. But too great a recourse to mathematics, equations and models, is liable to hamper imagination at the outset of the effort, along the way, and/or in assessing their results. The economist George Shackle (a considerable mathematician himself) took the view that:

We cannot build up a general, omni-competent model by fitting together our special models, because it happens in many cases that one of these special models depends on assumptions incompatible with those required by another. Instead, we have to strive for an insight which fuses informally and, if you like, non-logically, a number of strands which, in their formal aspects, mutually repel each other [2].

Such a position is anathema to many mainstream economists, who have come to believe that only through mathematics, modelling, and the application of over-simplified theories can their professional status be exemplified. In an interview in 1983 Shackle was even blunter: “Those economists who are going to give advice, or who are going to be advisors either to governments or to business, should have their training based in economic history, and they only need as much theory as you find up to the second year textbook.” [3]

There has been an expansion of the literature reminding us of catastrophic events in the past – some related to general climatic events, some to more regional catastrophes, and some to cataclysmic events such as asteroids or comets striking the Earth or voluminous volcanism. The latter lie beyond what it is reasonable to expect concerns about energy policy to cover. But many of the other threats to sustainable development just touched upon need to be considered in developing scenarios, and explaining vulnerabilities, of the global energy system in the 21st Century and beyond. The concern that some of us have is that detailed modelling of the myriad of uncertainties and inter-connections which exist lie beyond useful modelling – the sort that allows third parties to understand what has occurred during the modelling exercise. Instead, a simpler approach, keeping the mathematics in proportion to needs, may be more comprehensible and more likely to sway energy policy in needed directions. At the end of the day, what are required are precautionary policies, measures, investments and actions by end-users which are fit for purpose. All too often they fail on that basic premise.

With the arrival of “Energy Research & Social Science” we at last see a journal encompassing history, behavioural change, some fundamental technical issues surrounding energy resource availability, energy transitions, real economics, potential risks and externalities, and energy research methodology [4]. This paper touches on all these, and how they may be better understood and addressed.

2. Ignorance of history

Joseph Tainter’s “The Collapse of Complex Societies” [5] provided a rich treasury of examples of how the declining marginal returns on energy production have resulted in the collapse of

earlier societies. Minoan civilisation is just one of 18 cultures which he considered, and he concluded that complex societies depend on the production of agricultural, energy and minerals production. He found that energy and minerals production follows the same productivity curve as subsistence agriculture, that fuel resources used first by a rational human population are those that are most economically exploited, and that when it becomes necessary to use less economical resources then marginal returns automatically decline. Some have followed the same trail but with more obvious (and to my mind unfortunate) ideological purpose, and while calling for “a radical critique of industrial society” from a Marxist perspective express hostility to the “many ecologists such as H.T. Odum, (who) make energy the central concept of their analysis of society and describe social mechanisms in terms of energy flows.” [6, p. xiv] In fact Howard Odum did make fundamental criticisms of the drive for economic growth in developed and developing economies on a wide range of practical grounds – 20 numbered points in one contribution [7].

Others, and Thomas Piketty offers a good example in his “Capital in the Twenty-First Century”, get things half right (and therefore seriously wrong overall). Piketty states: “To put it bluntly, the discipline of economics has yet to get over its childish passion for mathematics and for purely theoretical and often highly ideological speculation, at the expense of historical research and collaboration with other social sciences. Economists are all too often preoccupied with petty mathematical problems of interest only to themselves.” [8, p. 32] Here he reflects the predilection of standard economists to resort first to equations. Yet elsewhere Piketty falls into the same ideological trap he warns against by resorting to a narrow Marxist agenda. Some of the earlier societies examined by Tainter, Yoffee, Cowgill and others, resorted to territorial expansion to capture additional resources, but this was never permanently successful and in modern societies where population has grown and energy resources are stored, this is even less feasible (Tainter, pp. 214–215).

Climatic change has been cited as a major factor in explaining the collapse of some early complex societies, as well as tectonic changes. Droughts, reflecting climatic change, are favoured as one of the causes of the collapse of the Mycenaean and Roman civilizations. We do not, therefore, need to go back to early geological periods for evidence of climatic fluctuations. And as Geoffrey Parker has recently reminded us, in his: “Global Crisis: War, Climate Change & Catastrophe in the Seventeenth Century” (2013), the Little Ice Age also brought problems with it. There were crop failures, deforestation, claims of over-population, and other familiar claims, coming from North America across to China. Studies of the 13th and 14th centuries also indicate that the beginnings of the Little Ice Age impacted on agricultural yields and social stability, as did the bubonic plague, in parts of Western Europe.

3. Disregard of history

The recent financial crisis provides another rich resource of evidence for disregard of history. The vast outpouring of books and papers which trace its causes to faulty decisions about loans for housing and automobiles in the USA from the early 1970s, through what Michael Lewis called “Liar’s Poker” – the 1989 book that “revealed the truth about London and Wall Street”, to the financial follies of the UK’s Blair/Gordon “governance” – especially from 2001 tell their own story. Nouriel Roubini and Stephen Mihm have referred to the “Great Instability” being a better description of the coming era than the “Great Moderation” (“Crisis Economics: A Crash Course in the Future of Finance”, 2010, p. 300), but the issues discussed here go far wider than assets bubbles and busts.

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