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Energy and Civilization. A History (Vaclav Smil, 2017)

Référence bibliographique

Vaclav Smil, *Energy and Civilization. A History* (Cambridge: MIT Press, 2017)

Résumé

Energy and Civilization is a journey through the world history of energy from the discovery of fire to the latest energy transition. Smil reviews the evolution and differentiation of energy's uses and transformations, and energy's role in shaping economies. Furthermore, he evaluates energy's many benefits and problematic aspects. However, the book presents some epistemic and methodological challenges.

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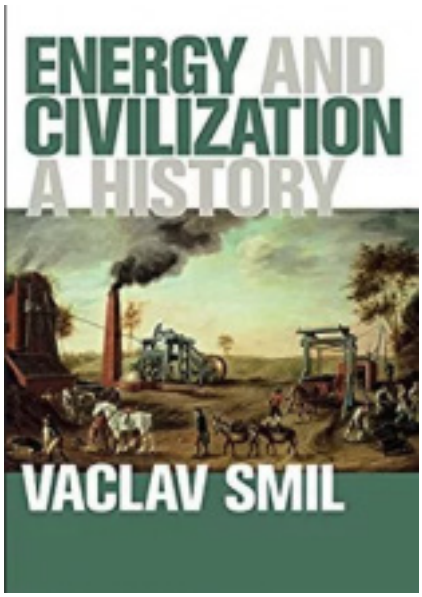

A GRAND EDIFICE

1 Vaclav Smil's *Energy and Civilization* is a monumental attempt at reconstructing the history of energy from prehistory to the contemporary era: energy's uses and transformations; its effects on the shaping of societies; the achievements it made possible, as well as its problematic aspects. This book is the latest step in a long series of works on energy that the author has been publishing in the last decades: a fecundity that, together with the author's meticulousness in data mining, and scrupulous research for adequate sources to support his claims, has made him into "the man who has quietly shaped how the world thinks about energy", as well as a favorite reading of America's technical, political, and financial elite (back in the 1980s and 1990s he collaborated as a consultant with the World Bank and the CIA, but also, more recently, with a number of Swiss banks. Microsoft's cofounder, Bill Gates, has also praised his works).[1]

2 The temporal, geographical, and disciplinary breadth of this work is remarkable: Smil's sources, both primary and secondary, range from prehistoric times to contemporary biofuels; from the history of technology to farm economy; and from China to Latin America. These hundreds of sources are harmonized to form a grand narrative edifice. The book is enriched by both a lavish iconographic apparatus, illustrating technological artefacts produced in different cultures and historical epochs, and tables and graphs synoptically presenting data, the painstaking collection of which must have involved a major research effort. It would be hard to find a work as broadly conceived as this one amongst scholarly monographs on the history of energy. The very task of setting off to produce a world history of energy from the emergence of human beings on Earth would be dismissed as unfeasible even by a team of professional historians. Smil, whose expertise ranges from environmental science to policy analysis, to nutrition and risk assessment, but does not include history, happily faced the challenge: his prolific production is the clearest witness to his polymath spirit. Such breadth, however, comes at a cost: while the book is longer than the average academic book, it still faces the problem of condensing millennia of world history in 450 pages.

AN ECONO-PHYSICAL VIEW OF ENERGY

3 The book includes six chronologically ordered, empirical chapters, preceded by an introduction and followed by a summarizing chapter that also includes concluding remarks. The empirical chapters cover: a) energy in prehistory, b) traditional farming, c) preindustrial prime movers and fuels, d) fossil fuels, primary electricity and renewables, and e) fossil-fueled civilization. From the very introduction the reader can get an idea of the main view of energy that underlies Smil's arguments throughout the book. To pinpoint it, we can refer to a tetrapartite distinction outlined in 1984 by the US National Research Council's Committee on Behavioral and Social Aspects of Energy Consumption and Production, a committee of social scientists charged with exploring the 'human dimension' of energy.[2] I believe that distinction is still valid today. The Committee

1 Quoted from: Paul Voosen, "Meet Vaclav Smil, the man who has quietly shaped how the world thinks about energy", *sciencemag.org*, 21 March 2018, https://doi.org/10.1126/science.aat6429.

2 Paul C. Stern, Elliot Aronson (eds.), *Energy Use. The Human Dimension* (New York: W.H. Freeman and Co., 1984), 14 ff.

identified four views of energy as: commodity (dominant in the US), ecological resource, social necessity, and strategic material. Each of these visions focuses on a different aspect of energy: respectively, the value of choice for present-day consumers and producers; energy in the context of biospheric systems; energy as a right—for home heating, cooling, lighting, cooking, transportation, etc.; energy as a geopolitical tool, mostly in terms of supply security.

4 Throughout the great majority of the book, it is the view of energy as commodity that predominates: the interests of energy producers and consumers take center stage. Only the very last section in the book changes its focus from the commodity to the ecological resource and strategic views. However, there is probably a fifth view of energy that is not mentioned in the NRC report: energy as a physical, all-encompassing parameter through which one can quantitatively evaluate human activities. Together with the commodity view, this is also Smil's favorite, to the extent that: "To talk about energy and the economy is a tautology: every economic activity is fundamentally nothing but a conversion of one kind of energy to another, and monies are just a convenient [...] proxy for valuing energy flows." (p. 344) That is, admittedly, a markedly reductionist view of economics, which, contrarily to what Smil argues, also includes historical and political contexts, and the NRC's 'human dimension'. These aspects seem to go missing in Smil's account. It is then not surprising that actions that most readers would never associate with energy balances (the 'energy cost of pregnancy', for example, p. 125) are treated by Smil as acts of energy generation, consumption, and savings.

TECHNOLOGICAL ANACHRONISM AND EVOLUTIONISM

5 In the book's last chapter, Smil spends quite some time warning against the indiscriminate use of energy in historical explanations: not everything that has happened in history, he says, can be explained by means of energy savings. While that sounds as a truism when one looks at energy from the standpoint of social or human sciences, when energy is approached with a reductionist mind set, Smil's is a providential caveat. However, in most of his book the author does not appear to practice what he preaches: he mostly adopts an energy-based, calculative approach to explain why, for example, a certain prehistoric society may have switched between different kinds of crops; he refers to amounts of chemical nutrients to assess the preference of certain kinds of fertilizers in traditional societies. That is as close to anachronism as one can get. It is perfectly fine, of course, to try and calculate the amount of proteins contained in a prehistoric meal: what is less historically justifiable, is to interpret past processes by attributing to historical actors ways of thinking and categories of analysis belonging to later times.

6 A further troubling point concerns Smil's argumentative lines to justify the preference of a supposedly more innovative technology over one that has ended up being dismissed. These are deeply indebted to a rational actor perspective that has been repeatedly challenged in works on societal aspects of energy. These works, however, are absent from Smil's references: as a consequence, readers are presented with a teleological discourse on the continuous evolution and improvements of technology, described in a parallel to the improvement of humankind. Smil is aware that the equation 'more refined energy flux coupling = more refined cultural mechanism' does not hold, and he criticizes Ronald Fox for his energy determinism (p. 431). Avoiding the trap of energy determinism, however, did not prevent him from falling into the parallel trap of technological teleologism, according to which for every new invention, there has been an improvement in the living conditions of humankind. By the yardstick of STS scholarship, this sort of technological evolutionism has a distinctive whiggish smack. Smil's non-nuanced references to works by George Basalla, a historian of science whose diffusionist approach has long been considered as analytically unsatisfactory, are also problematic.

TO TRANSITION OR NOT TO TRANSITION?

7 A second issue worthy of reflection is Smil's position on the relationship between economic growth, energy consumption growth, and energy transition. Also in this case, *Energy and Civilisation* is characterized by an ambiguous narrative, which may be interpreted as the consequence of a lack of reflexivity *vis-à-vis* the currently predominant economic system. In the book's ten final pages Smil casts some doubts on the possibility of perennial growth, it does so unconvincingly: readers feel that he would like to challenge the growth argument (as on p. 362, or where he mentions works on steady-state economy by Nicholas Georgescu-Roegen and on energy equity by Ivan Illich, for example), but that he is not entirely convinced that it can really be challenged. Smil believes that human beings should be concerned about the impact of our reliance on fossil fuels on the habitability of the biosphere (p. 425), yet he is extremely skeptical of renewable energy sources. On the one hand he approaches the problems of energy expansion (p. 295-6), but on the other hand he sees in US shale gas "enormous opportunities that remain to be fully exploited" (p. 424). How these apparently opposite views are supposed to harmonize with each other, it is unclear.

8 Smil's skepticism *vis-à-vis* renewables can also be noticed from his chapter on fossil fuel, primary electricity, and renewables, in which the focus is preponderantly on the first two (renewables are dedicated six pages out of the chapter's 69), as well as by his cursory dismissal of the German solar energy policies as the outcome of state subsidies, as opposed to what he defines as "a gradual, organic process" (p. 287). What he would like such an organic process to be based on, is left unspecified: arguably, market forces. So, while he argues energy transition to renewables will be extremely slow, by advocating the non-intervention of governments in this matter, he appears as prompting the self-fulfillment of his own bleak prophecy. In an interview with *Science*,[3] Smil mentioned that in 2000 fossil fuels provided 84% of Germany's energy, while after the implementation of the country's huge solar program, the share has barely dropped to 80%. He argued that, as a consequence, the program only benefited German industrialists, not the environment. What he seemed to forget is that, after the Fukushima accident, the German government implemented a major turnaround on its energy policies, by making the decision of gradually shutting down all of the country's nuclear plants. In the short-term, that meant an increase in the use of coal-burning power plants.

9 Contradictions similar to the ones mentioned with regard to energy transition are also to be found in Smil's attitude toward nuclear energy: on the one hand, he acknowledges problems of waste disposal, technical weakness, and high construction costs; on the other, however, he feels sorry that Europe and North America have left the initiative in "this clean, carbon-free way of electricity generation" to India and China (p. 284). How can a source of energy characterized by a major problem with waste disposal be considered as 'clean'? Smil is equally dismissive of wind energy, especially when applied to the US case: however, he acknowledges the recent growth of this market in Europe. His criticism of wind turbines on grounds that oil is needed to drill the ground for their foundations, gas for kilns to bake concrete, and coal for steel towers, appears as a straw man.[4] No advocate of renewables has ever argued that these sources will bring fossil fuel consumption to zero. What is rather discomforting, in Smil's account of the future role of renewables, is that he never mentions the importance of political decisions in the energy transition, nor does he ever consider social factors in the evaluations of these technologies, such as public perceptions, political beliefs, or the distribution of decision-making power. Renewables will not work in the short- to medium- term, according to Smil, just because in terms of cost-benefit analyses it makes little sense to replace more energy-dense sources of energy (fossil fuels) with less energy-dense ones. This is a very rational approach to reality,

3 Paul Voosen, "Meet Vaclav Smil", op. cit., (cf. note 1).

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but that is not how energy choices are generally made even today, let alone before the empowerment of accounting disciplines.

WHAT DRIVES TECHNOLOGY?

10 One of the most frequently debated questions in the STS has long been: does technology drive history? Does it drive society? And what is it that drives technology? These questions are connected to the question of agency. Questioning agency leads to a third problematic element in Smil's narration: the lack of it. Incidentally, lack of agency is perfectly in tune with Smil's pessimism regarding energy transitions: obviously energy transitions take longer if technologies are considered as disembodied tools. Quite often in *Energy and Civilization* are we presented with lists of inventions, one following another, introduced in this or that civilization, at this or that time, in what appears as a splendid edifice of rationalization of efforts, only tainted here and there by some passing failure. In fact, technological failure is almost never mentioned: when it is, the abandonment of a certain technology is justified on account of lesser efficiency. Technologies 'appear'; technologies perform acts ("Multitube planting drills reduced seed waste", p. 90), but what externalist historians would rather like to see here is perhaps fewer technical detail of moldboard ploughs or animal yokes, less namedropping of famous scientists and their inventions, and more on what social and political processes may have led to the adaptation and adoption of a certain technology. For example, when Smil mentions the evolution of the safety bicycle (p. 187), one would expect to find a reference to Wiebe Bijker's *Of Bicycles, Bakelites, and Bulbs*, a foundational work in the STS, in which the author convincingly argued that the final design of the safety bicycle did not ultimately win because of some intrinsically superior design. Some users felt that other early bicycle variants represented superior designs.[5]

11 To do justice to Smil, one needs to acknowledge that information on agency is sometimes impossible, or extremely hard to obtain for most of the time of the Homo sapiens sapiens era, in the almost total absence of written sources. And Smil honestly admits that (p. 42). But one may then legitimately ask: considering the multiplicity of activities in which energy is employed, the complexity of their interactions, and the difficulty in identifying agency until recently in history, is a history of energy possible at all? Isn't it too pretentious a task for an individual researcher? Imagine you want to write a book on the history of water and civilization. Multiply that for all possible energy sources, and you are more likely to require the work of a team of historians and archaeologists with varied language expertise for a decade, in order to come up with a historically meaningful account.

12 Even when he deals with more recent technological developments concerning energy, Smil does not seem too concerned with providing socio-political contexts: he is more interested in showing technical details of a particular furnace and the energy savings it allowed. Unfortunately, this unproblematized approach to the history of technology does not do justice to decades of social constructivism. One of the consequences is that Smil contributes to a history of technology that is marked by a linear view, where energy is constantly entangled with "evolutionary and modernist ways of thinking" that have been broadly criticized by contemporary historians of technology.[6] Sentences such as "without sickle and plow there would be no cathedrals" (p. 52) are debatable to say the least: since historical processes are not predetermined, we may have had cathedrals even without ploughs and sickles (or we may have had sickles and ploughs but no cathedrals, for that matter).

13 The introductory chapter is called "Energy and Society", but society is conspicuous by its absence throughout this work (including the

5 Wiebe Bijker, *Of Bicycles, Bakelites, and Bulbs. Toward a Theory of Sociotechnical Change* (Cambridge, MA: MIT Press, 1995).

6 Quoted from: Anna Szolucha (ed.), *Energy, Resource Extraction and Society. Impacts and Contested Futures* (London: Routledge, forthcoming in 2018), Introduction.

introduction itself). To be fair, Smil does produce some cameos of society here and there, as when he mentions the miserable working conditions of women and children in Scottish mines (p. 230). But that is a rather isolated remark until the last ten pages of the book, when issues of energy equity are mentioned and consumerist society is heavily criticized (although the political-economic system generating it is not). One would be deceived if one were to browse *Energy and Civilization* for a reflection on the catastrophic human consequences of centuries of resource extraction: little mention is made of the colonial era and the attendant slaves' role in producing resources (except in terms of energy cost needed in the building effort, p. 203), or of the inequity characterizing the production of energy in capitalist, 'anthropocenic' societies. We found only a brief reference to the fact that energy decoupling in Western societies is occurring at the cost of displacement of greenhouse gas emissions to poorer countries (p. 348), and while Smil sometimes mentions environmental consequences of overexploitation of resources, two lines later he is back on the exaltation of energy consumption as a universal measure of economic growth.

HISTORY FOR THE ELITES

14 This work is very likely to please the world's technopolitical elites: it hardly summons issues of power and equity; it advocates a developmentalist and incremental view of innovation; it affirms that the world needs switching to less carbonated energy sources but also that that will only happen in an extremely distant future, and that fossil fuels will dominate for time immemorial. In line with the neoliberal doctrine, Smil argues that the only remedy people can take are individual ones, such as consuming less meat or insulating their houses better. The body politic is nowhere to be found; collective action is not contemplated. In terms of societal action, this is a view that overemphasizes linearity and continuity, while running the risk of being interpreted as self-absolutory. When one turns over the last page of the book, in spite of the glimmer of hope that Smil provides in the final paragraph on the limits of energy explanations, one is left with the bitter aftertaste that only what has already happened in history, can happen again; what has not yet happened, cannot and will not happen.

POTENTIAL AUDIENCE

Ultimately, the richness of data this book pres- 15
ents can hardly be overrated, its cohesiveness and its plain—although at times excessively dry—language, make it a compact compendium of energy and technology (and much less, society). While historians of science and technology—especially those oriented towards social history—may find it desperately lacking in human agency and *passé* in its teleological narrative, the book will definitely stimulate the curiosity of readers versed in natural sciences or engineering that may have an interest in a well-structured, introductory smattering on the history of energy. Economic historians and energy historians may also find it useful as it provides a grand and detailed synoptic picture of the effort deployed by human beings in harnessing energy for the production of material benefits.

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