

The metrics of energy

Energy in nature and society

Vaclav Smil
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Reviewed by Bernard Bulkin

'I firmly believe that the key to managing future global energy needs is to break with the current expectation of unrestrained energy use in affluent societies.' It is with this statement that Vaclav Smil begins the conclusion to this masterful book. Smil is probably the most knowledgeable person in the world about all aspects of energy. This book, his 22nd, is a comprehensive demonstration of that assertion.

Smil's approach, which he developed and used in his previous volumes, is to establish some key metrics around sources and uses of

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energy. Many authors use energy density (J/m^3) or specific energy (J/kg) but Smil also shows us how important energy concentration (J/m^2) can be.

If we want to compare the growing, harvesting and processing of biomass as an energy source with coal, energy concentration offers important insights

The metrics that he uses, in a very consistent way throughout his analysis, are crucial to considerations of viable approaches to addressing the greenhouse gas problem. All too often in what we read in the popular, political, or semi-scientific press, these metrics are ignored or used inconsistently.

The span of material covered here is immense. From fossil fuels to agriculture to basal metabolism rates. And the quantity of detail is similarly huge.

There are times when the volume of numerical facts is just excessive – such as several pages on the embedded energy of the Great Pyramid – but mostly they are just fascinating.

Many of the ideas discussed in this book require a fair degree of understanding of relatively advanced scientific concepts. Well educated chemists will be able to follow these, but not from the brief attempts at explaining them in the text.

Still, this is a book to learn from and enjoy at many levels. And where else could you find a comparison of the energy flow of solar radiation intercepted by the earth with that of a large hen egg and a fly on a kitchen table?