

“Assessing and Measuring Environmental Impacts in Engineering”

Edited by Jiří Jaromír Klemeš (Research Institute of Chemical and Process Engineering, University of Pannonia, Hungary), Butterworth-Heinemann, an imprint of Elsevier, Oxford, UK, 2015, 608 pages, ISBN: 978-0-12-799968-5, £85.00, US\$140.00, €100.00

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As the editor describes in the introduction, “This book offers an overview of a project where a number of leading personalities in the research and development of the methodology in sustainability field agreed to join forces in the development of a comprehensive edited publication covering the major aspects and issues of assessing and measuring the environmental impact and sustainability”. The subject of sustainability measurement is one that is not often found in published research papers. This book brings together the expertise of 15 groups of respected academics in the field over the last decade, in a collection of self-standing papers.

The book has been structured into four parts allowing the reader to access whichever topic is of most interest, without needing to read all the previous chapters.

- **Chapters 1–3:** Definitions of sustainability and systems approaches to measurement
- **Chapters 4–7:** Sustainability assessment and quantification of environmental footprints

- **Chapters 8–13:** Designing sustainable processes – planning and strategic tools, and supply chain considerations
- **Chapters 14–15:** Policies steering industrial and economic development towards sustainability.

Sustainable Development

Each paper starts with the 1987 definition of sustainability from the Brundtland Commission: “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (1) and then sets out to define a way to quantify the sustainability of a chosen system or manufactured product. These systems vary vastly in their complexity, from a range of biofuels in Chapters 4 and 8 to whole brownfield development sites and even cities in Chapters 10 and 15.

The reader comes away with the overwhelming conclusion that the quantification of sustainable development is still in its infancy and that there is no ‘one size fits all’ methodology for doing so. The authors show that it is possible to define a set of parameters and equations to discriminate between the environmental benefits of a variety of related scenarios in a particular system. At the same time, they also note that the same equations cannot necessarily be extended to

an unrelated system or scenario, where the relative importance of individual environmental parameters likely will need to be ranked differently. In most chapters the overall conclusion appears to be that it is better to report transparently the individual footprints of a system, for example the carbon, water or nitrogen footprints, rather than depend upon a single amalgamated ‘environmental footprint’ to compare scenarios.

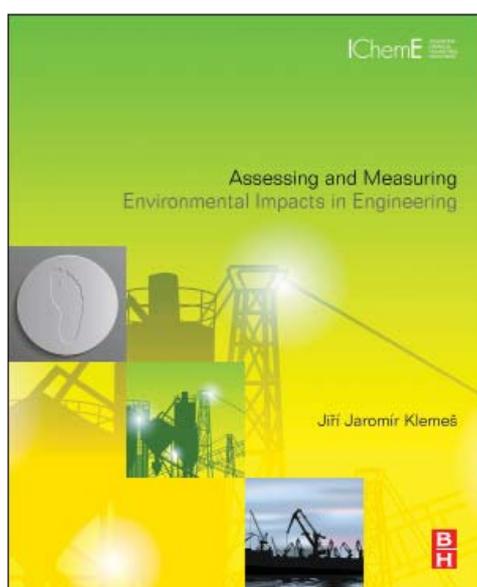
In every paper the authors concentrate on explaining their mathematical methods from first principles, so this book would not suit a reader who shies away from complex mathematical equations. However, the merit of this approach is that it enables the practitioner to really understand the limitations in their chosen method of measuring sustainable development. Thus, I would recommend it as an introductory text book to any postgraduate scientist or engineer interested in working in this field.

What is absent from the book is a discussion of the relative merits of the various software packages currently available for calculating environmental footprints such as SimaPro (2), GaBi (3) and ecoinvent (4). This seems a little short-sighted, since they are often what are cited in academic papers by industrial practitioners in the field of product environmental footprinting, who may have limited understanding of the mathematics and assumptions behind the software they depend upon for evaluating real-life solutions to sustainability dilemmas. Neither could I find any discussion of the application of the publically available International Organization for Standardization (ISO) standards for environmental

footprinting 14040:2006 (5). There is also no mention of various government-funded initiatives currently underway to calculate and reduce the environmental footprints of product groups, most significantly the European Commission’s Product Environmental Footprinting (PEF) (6, 7) and Circular Economy (8) projects. Perhaps this is because these programmes are still ‘active’, but as they form a large part of the work being carried out in this field, in Europe at least, over the last five years, their entire omission may seem surprising to readers a few years from now.

References

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The Reviewer

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