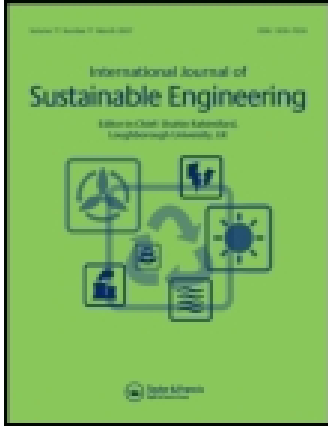


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Publisher: Taylor & Francis

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## International Journal of Sustainable Engineering

Publication details, including instructions for authors and subscription information:  
<http://www.tandfonline.com/loi/tsue20>

### The role of the engineering community in sustainable development

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Published online: 27 Jun 2008.

To cite this article: Shahin Rahimifard & Allen J. Clegg (2008) The role of the engineering community in sustainable development, International Journal of Sustainable Engineering, 1:1, 1-2, DOI: [10.1080/19397030802237485](https://doi.org/10.1080/19397030802237485)

To link to this article: <http://dx.doi.org/10.1080/19397030802237485>

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## EDITORIAL

### The role of the engineering community in sustainable development

Welcome to the first issue of the International Journal of Sustainable Engineering (IJSE), a journal dedicated to the transmission of information and knowledge on sustainable development and sustainability for the engineering community. The achievement of the underlining principles of sustainable development, defined as part of a global vision for 'Our Common Future', is part of a journey that many experts argue has just begun. The recent meteorological events and the resulting major disasters linked to the impact of global warming and climate change have created unsurpassed interest and support throughout the international community and perhaps most importantly by businesses and governments. This has resulted in an unprecedented explosion in research driven by the needs to reduce the impacts of global warming and to conserve rapidly depleting resources. At the same time tremendous opportunities have been created for the engineering community to develop methods, technologies and tools which can transform the realisation of sustainable development principles from a conceptual vision to a common reality.

Engineering is a term that covers a diverse range of skills, knowledge and expertise, so how can a single journal cover all the engineering interests? Add to this the range and complexity of sustainable development and sustainability and it might seem to be an impossible task. Nevertheless, we have launched the Journal with the premise that engineers have a major responsibility for, and role in, the development of sustainable solutions and that such solutions will require 'multi-disciplinary skills'. Sustainable solutions will require lateral thinking and knowledge transfer between engineering disciplines, and therefore what better way of supporting these needs than by developing a multi-disciplinary journal that encourages sharing of knowledge between engineers whatever their background?

The benefits of this multi-disciplinary research approach are highlighted by several papers in this first issue. For example, there are three papers that highlight the importance of modelling and incorporation of user and consumer behaviour in the sustainable engineering paradigm. They have demonstrated the achievement of this goal using a variety of case

studies. Lockton *et al.* review approaches that have been used to change user behaviour to make the user more efficient and discuss examples for the implementation of user-focused considerations in sustainable engineering and eco-design. Wever *et al.* continue this theme with their paper that seeks to break the historical approach in which actions to mitigate a product's adverse effects on the environment were based on those factors under the control of the manufacturer. They focus instead on the way in which users interact with the product. The authors have reviewed appropriate strategies to enable designers to consider user behaviour and provide a case study for an energy meter. Although the importance of the consumer is also emphasised by Short, his premise is that economic sustainability for a manufacturing business is the essential pre-requisite to sustainable products and processes as only those businesses that produce products desired by consumers can survive to practice sustainable engineering. The fourth design-oriented paper considers the inter-relationship between product design and end-of-life treatment. Product recovery at end-of-life (EoL) is advocated as a method of conserving resources and reducing waste but what are the product properties that are essential to optimise the value attainable from (EoL) products? Johansson addresses this question in his paper and, from quoted case studies, concludes that there are four principal product properties (denoted disassembly properties) that should be considered at each phase of the product development process.

These design-oriented papers are complemented by two papers that consider manufacturing issues, Rao proposes a methodology for the environmental impact assessment of manufacturing processes using a combinatorial mathematics based decision making process. He presents a manufacturing example that demonstrates how alternative manufacturing processes can be evaluated and ranked to enable the producer to make an informed choice between competing processes. Waste minimisation, in the industrial context of printed circuit board manufacture, is considered by Bains *et al.* The authors report the evaluation of novel processes such as special electroplating techniques, advanced oxidation methods to

remove organic contaminants, and new ion exchange systems that can contribute to a more sustainable practice. They describe their progress with viable process demonstrations and offer views on process integration for improved sustainability.

The drive to produce more energy from renewable resources presents challenges for engineers to develop efficient conversion processes and control systems but such equipment must not adversely affect the very nature that the systems are ultimately intended to protect. The paper by Lazarevic *et al.* considers the systems that are necessary to understand the impact that wind turbines might have on birds and bats. Although their paper focuses on motion detection systems rather than a solution to the problem, understanding and quantifying fauna-turbine interactions may encourage engineers to design turbines that incorporate protection systems.

As 'Education for Sustainable Engineering' is one of the major themes of the new journal, it is appropriate that we should conclude the inaugural issue of IJSE with a paper that describes an educational project to develop teaching sustainable development issues to engineers and two relevant book reviews for those involved in education. The importance of engineering for the delivery of sustainable development is widely recognised and environmental responsibility and sustainability are finding their way into engineering syllabi. However, the multi-disciplinary nature of sustainable development presents a real challenge to educators who already must deal with the multi-disciplinary nature of engineering. This is compounded by the need for engineers to understand business and economics if they are to convert engineering solutions into business propositions. Stand-alone or 'bolt-on' modules provide a less than satisfactory approach to the education of engineers. What is really needed is an ethos within educational establishments that supports and promotes sustainability in all activities and in all courses at every level.

A project to develop a multi-disciplinary pilot module in sustainable development for undergraduate engineers and scientists, sponsored by the Royal

Academy of Engineering in the UK, is described by Tomkinson *et al.* The authors explain how they designed inter-disciplinary exercises, the method of assessment of the students' work and the results of an evaluation of the pilot module from the perspectives of students and teachers. The educational theme is extended by two book reviews: the first considers how an educational institution embedded sustainable development within its diverse curricula; and the second considers a text developed specifically to support students and engineers involved in the practice of sustainable design.

The success of this journal will be determined primarily by the quality of its content and by the value it is perceived to offer to practicing engineers. We hope that readers will identify strongly with the journal's objectives and support it by the submission of papers. The editorial and publishing staff will continue to promote the journal using all the means at their disposal. A crucial element will be partnerships with appropriate conference organisers to identify suitable conference papers that might be developed for journal publication. We are also working to identify Special Issue themes and, equally important, engineers who will act as Special Issue Editors to develop those themes.

Finally, we would like to acknowledge the support of our Editorial Board Members during this early stage of journal development, and to invite comments and constructive suggestions by the wider engineering community on how future issues of the journal could provide valuable support for their activities.

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