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# State of Education for Sustainable Development

## Embedding Sustainable Development into Engineering Education

*'An ever-increasing global population that continues to shift to urban areas will require widespread adoption of sustainability. Demands for energy, drinking water, clean air, safe waste disposal, and transportation will drive environmental protection [alongside] infrastructure development. What inspirational role will engineers play in that radically transformed world?'* **Barry Grear (AO), Australian Engineer and incoming President, WFEO**

As we face significant planetary issues such as global warming, ocean acidification, biodiversity loss and urban migration, it is clear that the engineering profession has a significant part to play in affecting the future of our planet. It is clearly no longer possible to be a professional engineer and ignore the challenges and opportunities that arise from needing to achieve sustainable development. There is therefore a need and strong business case for engineering firms and university engineering schools to embrace sustainability. Whether you want to attract the best and brightest, or you wish to ensure that your students/employees are equipped with appropriate knowledge and skills to meet client needs, training for sustainability is recognised as essential.

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### Workshop 1: Elements of Curriculum Renewal to Embed Sustainability into Engineering Education

Friday 7 December, 9am – 4pm, Melbourne



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### Workshop 2: Emerging Engineering Education Curriculum for Sustainable Development

Wednesday 12 December, 9am – 4pm, Melbourne  
Register through the A<sup>2</sup>E<sup>2</sup> Secretariat



Delegates registering for the above workshop may also be interested in attending a second workshop following the A<sup>2</sup>E<sup>2</sup> conference. It will launch the latest set of content on energy efficiency that has been prepared in partnership with CSIRO and the National Framework for Energy Efficiency (NREE). The format for the workshop is as follows:

#### 1) Professional Development for Sustainable Engineer (Industry Professional Development Level)

The first session will be delivered in partnership with CSIRO and the National Framework for Energy Efficiency (NREE). It will launch materials developed through a CSIRO Energy Transformed Flagship grant, called the 'Sustainable Energy Solutions Program'.

#### 2) Introducing Students to Sustainable Engineering (1<sup>st</sup> – 2<sup>nd</sup> Year Introductory Level)

This session will overview content on introducing sustainable engineering, based on the first two modules of the 'Engineering Sustainable Solutions Program - Critical Literacies Portfolio'. This content, funded by UNESCO, Engineers Australia and the Society of Sustainability and Environmental Engineering were awarded the 2005 Prime Minister's Banksia Award for Leadership in Environmental Education.

#### 3) Teaching Technical Design for Sustainable Engineering (3<sup>rd</sup> - 4<sup>th</sup> Year/ Masters Design Level)

This session will overview content on whole system sustainable design, based on the *Engineering Sustainable Solutions Program - Technical Design Portfolio: Whole Systems Design Suite*. Funded by the Federal Government's Department of Environment and Water Resources, it is of relevance to all engineering disciplines.

***All materials covered during this workshop are freely available, open-source online resources.  
Delegates will be provided with samples during the workshop.***

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## **Workshop Context - Emerging Engineering Education Curriculum**

Over 60 percent of environmental impacts are determined for many engineered systems by decisions made in the design phase of project development. Engineers, designers, technical officers and architects involved with the design process therefore have a critical role to play in contributing to sustainable development.

Twenty years on from the publication of 'Our Common Future' and 15 years since the first World Summit on Sustainable Development, there has been a concerning lack of progress on embedding sustainability within higher education engineering education. Case studies appearing in conferences and academic journals globally are documenting the isolated success by particular staff in particular flagship courses. However, these efforts are rarely documented as part of a longer term strategic plan for curriculum renewal.

The generation of critically reviewed, academically rigorous material on sustainable development has been identified as a key barrier to accelerating the transition to engineering education for sustainable development. The Natural Edge Project has been building such content for the last four years and is pleased to present the available packages to workshop participants. We also look forward to participant feedback on the materials as the content continues to be developed.

### **Workshop Lead Facilitators:**



**Mr Charlie Hargroves** is the Project Director for The Natural Edge Project (TNEP) and a Research Fellow in the Centre for Environmental Systems Research at Griffith University. A 2000 graduate of the University of Adelaide, Charlie practised as a Civil and Structural Engineer before co-founding TNEP as a special project initiative within the Institution of Engineers Australia. Charlie co-edited 'The Natural Advantage of Nations' (Earthscan 2005) and is now directing two publications: a 20 year response to 'Our Common Future' (1987) and an update to 'Factor 5' (1997). His PhD (Murdoch Uni. Inst. for Sustainable Technology Policy) is 'Adaptive Governance and Knowledge Strategies for Operationalising Sustainable Development'.



**Mr Michael Smith** is the Research Director for The Natural Edge Project and a visiting Research Fellow to the Australian National University. Michael completed a double major Science degree in Chemistry and Mathematics from the University of Melbourne. In his honours year at the University of Sydney, he conducted research into alternatives to ozone layer destroying chemicals. He then moved to Canberra to research atmospheric chemistry. After co-founding TNEP, Michael changed thesis topic and recently submitted to ANU on "Advancing and Resolving the Great Sustainability Debates" co-supervised by Professor Stephen Dovers.



**Ms Cheryl Desha** is the Education Director for The Natural Edge Project and a Lecturer in the School of Engineering. A graduate of Environmental Engineering (Griffith University, university medal) Cheryl was the 2005 Australian Young Engineer of the Year. Her teaching and research role includes developing course material and delivering training to embed sustainability critical literacy skills into curriculum for undergraduate, and postgraduate students. She is currently undertaking her PhD on developing a curriculum renewal framework for transitioning to engineering education for Sustainable Development and is on the International Advisory Panel for the 'International Journal of Sustainability in Higher Education'.

The Natural Edge Project (TNEP) is a partnership for education, research and policy on innovation for sustainable development. TNEP's mission is to contribute to and succinctly communicate leading research, case studies, tools, and strategies for achieving sustainable prosperity across government, business and civil society. Driven by a team of early career Australians, the non-profit Project receives mentoring and support from a range of experts and leading organisations in Australia and internationally, through a generational exchange model. As of January 2007, TNEP moved from Engineers Australia to Griffith University and Australian National University (ANU) as in-kind hosts.

For the last five years, TNEP has been engaged in developing a range of tertiary level curricula through the 'Engineering Sustainable Solutions Program'. In 2005, TNEP received the Banksia Award for Leadership in Education and Training for these materials and the text book 'The Natural Advantage of Nations'. A significant proportion of the curriculum is freely available online and open-source (International Creative Commons Licence). In 2008, TNEP will publish a special issue of the International Journal of Sustainability in Higher Education (September issue) on the 'State of Education for Sustainable Development – Engineering Education'. This will include papers on: a gap analysis of engineering education globally; using student attributes and preferred competencies to inform a rapid transition towards engineering education for sustainable development; a procedure for assessing engineering curriculum for sustainability content; and lessons learnt from experiences to date in developing open-source, online sustainable development curriculum for engineering education.