

NZSSES Blueprints Conference 2008

**Delivering more-sustainable
infrastructure by teaching the next
generation engineering for
sustainable development**

Professor Roger Venables

*Managing Director, Crane Environmental,
Royal Academy of Engineering Visiting Professor in
Engineering Design for Sustainable Development
at Queen's University Belfast
and Chief Executive CEEQUAL Ltd*

Sustainability in Design Teaching

- Coverage:
 - **The RAEng VP Scheme**
 - Objectives and achievements so far at Queen's and elsewhere
 - **What is still planned to be completed**
 - Challenges
 - **Hoped-for outcomes**



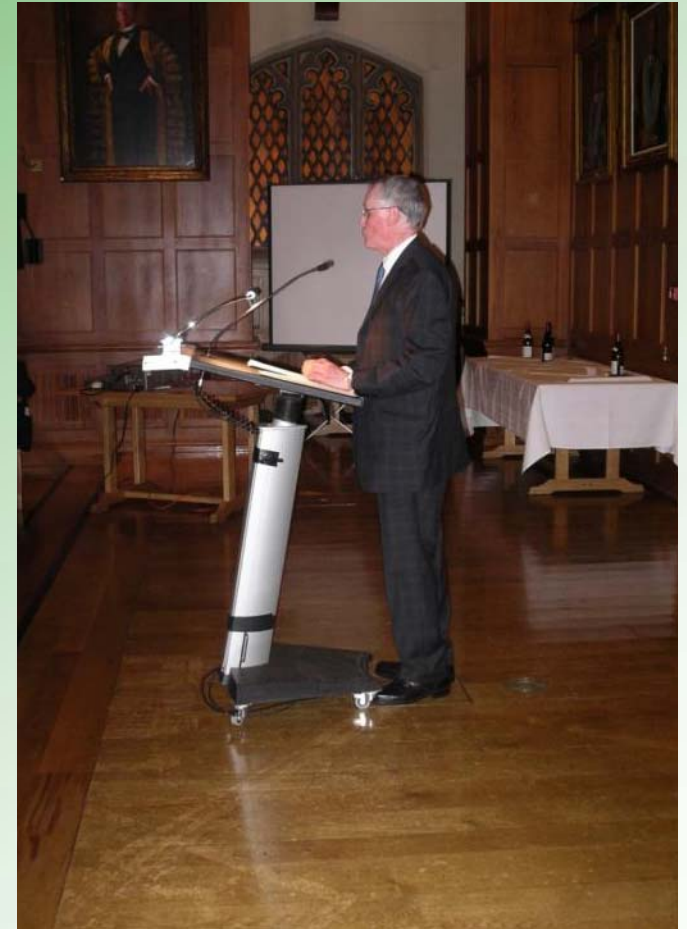
Sustainability in Design Teaching

- **The RAE Visiting Professorship Scheme**
 - **Supports VPs at UK universities for 5 year stints**
 - VPs in Engineering Design for Sustainable Development followed earlier scheme on Engineering Design – now VPs in Integrated Systems Design
 - **Across all engineering disciplines, and seeking to involve non-engineers**
 - 26 appointed – RKV one of 6 in 2002 (5 in 2003, 0 in 2001, 5 each in 2000, 1999 and 1998)
 - **Initial 3 years, almost all extended to 5**
 - Primary task = preparation of case-study-based teaching materials to embed SD in engineering curriculum

➤ **Results meant to be available to all UK Universities**

Sustainability in Design Teaching

- **RKV's overall role as VP at Queen's**
 - **Faculty-wide but so far mostly in SPACE**
 - Working towards SD thinking being embedded in teaching of all engineering, especially in design
 - **Assisting with staff development on SD**
 - RKV teaching as pre-cursor to the staff developing their own teaching of engineering design for SD
 - **Exit strategy - Working oneself out of the job!**
 - Supporting the wider application of SD principles at the University



*RKV Academic Sponsor,
Professor Adrian Long*

Sustainability in Design Teaching

- **RKV's specifics at Queen's**
 - **Development and use of case studies (for teaching of 'Engineering Design for Sustainable Development')**
 - **Curriculum Development – embedding SD thinking**
 - **Assisting teaching staff up the sustainability learning curve**
 - **RKV Teaching – introductory *and* SD in design, plus modifications to major projects, and Design at all levels**
 - **Supporting preparations for re-accreditation by JBM and new SD Guidelines**
 - **Identifying colleagues to 'carry the torch' forward**
 - **Links with other relevant groups**
 - **Supporting development of SD-driven research**

Sustainability in Design Teaching

- **Example changes**



We need to think in terms of 'one-planet-living', not three

Think globally – act locally

Engineer locally, while thinking globally



New UK Government Sustainable Development Strategy

Living Within Environmental Limits

Respecting the limits of the planet's environment, resources and biodiversity – to improve our environment and ensure that the natural resources needed for life are unimpaired and remain so for future generations.

Ensuring a Strong, Healthy and Just Society

Meeting the diverse needs of all people in existing and future communities, promoting personal wellbeing, social cohesion and inclusion, and creating equal opportunity for all.



Achieving a Sustainable Economy

Building a strong, stable and sustainable economy which provides prosperity and opportunities for all, and in which environmental and social costs fall on those who impose them (polluter pays), and efficient resource use is incentivised.

Promoting Good Governance

Actively promoting effective, participative systems of governance in all levels of society – engaging people's creativity, energy, and diversity.

Using Sound Science Responsibly

Ensuring policy is developed and implemented on the basis of strong scientific evidence, whilst taking into account scientific uncertainty (through the precautionary principle) as well as public attitudes and values.

Sustainability in Design Teaching

- **Example changes**
 - **All civils students have SD addressed by RKV every year**
 - **Mock Public Inquiry project re-focussed into an SD context**
 - **Social aspects of Hazards & Disasters project enhanced**
 - **Case histories developed**
 - **Major learning points identified from them**
 - **Level 1 Communications focus on SD with marked essays**
 - **Level 2 Design – sustainability applied to design of elements**
 - **Level 4 Design – Sustainability appraisal now a marked element of design projects**
 - **Timber bridge design module – added focus on sourcing, waste minimisation, design for minimum waste**
- **But ... NOT diluting $wl^2/8$**



CEEQUAL – The **Civil Engineering** **Environmental** **QUALity** Assessment & Awards Scheme

www.ceequal.com

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<p>CEEQUAL A Civil Engineering Environmental Quality Assessment and Award Scheme</p> <p>■ Home ■ Background ■ How CEEQUAL works ■ Awards ■ Contact Us</p>			 <p>■ Training Courses</p> 
<p>What is CEEQUAL ? Benefits of CEEQUAL</p> <p>What is CEEQUAL?</p> <p>CEEQUAL is an awards scheme assessing the environmental quality of civil engineering projects - a civil engineering equivalent to BREEM for buildings. It is being promoted by ICE, BRE, CIRIA and a group of committed industry organisations. Its objective is to encourage the attainment of environmental excellence in civil engineering projects, and thus to deliver improved environmental performance in project specification, design and construction.</p> <p>CEEQUAL uses a credit-based assessment framework, which is applicable to any civil engineering project and includes environmental aspects such as the use of water, energy and land as well as ecology, landscape, nuisance to neighbours, archaeology, waste minimisation and management, and community amenity.</p> <p>A CEEQUAL award publicly recognises the achievement of high environmental performance. Awards are made to projects in which the clients, designers and contractors go beyond the legal and environmental minima to achieve distinctive environmental standards of performance.</p> <p>Benefits of CEEQUAL</p> <p>CEEQUAL:</p> <ul style="list-style-type: none"> provides a benchmark standard for environmental performance demonstrates the commitment of the civil engineering industry to environmental quality celebrates the achievement of high environmental standards in civil engineering projects. <p>A CEEQUAL Award for your civil engineering project will identify you as an organisation that:</p> <ul style="list-style-type: none"> measures and compares standards of performance, respects people and the society in which it operates, undertakes its work in an ethical and sustainable manner, acts in a socially and environmentally responsible way, protects and enhances the environment, <p>and is concerned about the major impacts of construction on the environment and the earth's resources.</p>		<p><i>"I am delighted that my Department has been able to support the development of this scheme. In many ways, it is complementary to the Government Construction Clients Panel Sustainability Action Plan - Achieving sustainability in construction procurement. If the next stage of work is as positive as the first, it is possible that CEEQUAL could be developed into a scheme which government clients can use to set targets for infrastructure works in the way they now use BREEM to set sustainability targets for government buildings. Development of strategic plans for greater sustainability will only have force if development of the tools to allow implementation of those plans proceeds in parallel. CEEQUAL has the potential to become a welcome addition to the sustainability toolkit and to help facilitate the creation of a more sustainable built environment."</i></p> <p>- Brian Wilson, Minister of State for Industry and Energy, talking about CEEQUAL at the ICE Sustainability Sector Strategy launch, April 2002.</p>	

RAEng Guide to Engineering for Sustainable Development



Engineering for Sustainable
Development: Guiding Principles



- **Contents**
 - **Introduction**
 - **Examples of Sustainability Issues in Engineering**
 - **12 Guiding Principles**
 - **The Principles explained**
 - **The Principles related to the Examples**
 - **Application of the Principles in Practice**
 - **Use of the Guide in Academia, Practice**

and Personal
Development

- 1. Look beyond your own locality and the immediate future**
- 2. Innovate and be creative**
- 3. Seek a balanced solution**
- 4. Seek engagement from all stakeholders**
- 5. Make sure you know the needs and wants**
- 6. Plan and manage effectively**

- 7. Give sustainability the benefit of any doubt**
- 8. If polluters must pollute... then they must pay as well**
- 9. Adopt a holistic, 'cradle-to-grave' approach**
- 10. Do things right, having decided on the right thing to do**
- 11. Beware cost reductions that masquerade as value engineering**
- 12. Practice what you preach.**

Delivering sustainable development

1. Look beyond your own locality and the immediate future

12. Practice what you preach – do not expect more of others than you expect of yourself.

Sustainability in Design Teaching

- **Moving forward**
 - **RKV role extended**
 - **Institute for a Sustainable World started**
 - **Preparation of materials to enable an intro module, and intro lectures to be delivered by staff**
 - **Module reviews to link them to SD agenda and intro modules and lectures**
 - **Embedding SD thinking in delivery as a result**
 - **Continued RKV Teaching but in collaboration with staff**
 - **Identifying more colleagues to 'carry the torch' forward**
 - **Roll out to other schools**
 - **Continued support for ISW**

Examples from elsewhere in Queen's and other Unis

- **Permanent posts in SD, not just in engineering**
- **MSc's in Leadership for SD, Engineering for SD, Sustainable Architecture ... but not yet in Sustainable Infrastructure**
- **Other SD Research Units**
- **Not just in engineering – Mech, Elec, Aero, Chemical**
- **Not just in engineering – Planning, Geography, Law, Management, Chemistry ...**
- **Not just about teaching – Talloires, EMS for Universities**

Sustainability in Design Teaching

- **The challenges?**
 - **Staff development and engagement**
 - **Reaching consensus about what needs to be done to the courses and modules**
 - **Developing good materials that others will *want to use***
 - **Creating markable assignments**
 - **Finding room in modules**
 - **Finding room in the timetable**
 - **Long-term commitment**



- **The challenges continued**
 - **Embedding ...**
 - **Keeping it all current and up to date with developing thinking**
 - **Funding im-permanency**

Sustainability in Design Teaching

- **And the outcomes for students?**
- An understanding and appreciation of
 - **sustainability and SD**
 - the contribution of engineering generally to their delivery
 - **the constraints they place on engineering practice**
 - the principles of engineering design for SD
 - **the role of their chosen specialism in SD delivery**
 - the importance of multi-disciplinary working to delivery of modern infrastructure and buildings



- Student outcomes cont'd
 - **Project-based experience of applying the principles**
 - Delivery of their own commitment?

Sustainability in Design Teaching

- **Summary?**

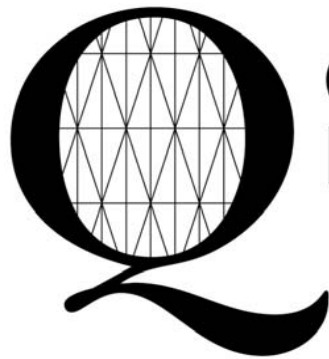
- **Come a very long way**
- **A warm welcome for the initiative – staff and students**
- **Wide range of enthusiasm and uptake – staff and students**
- **SD and one-planet-living ethos introduced, and specific changes made already**
- **Re-accreditation in line with JBM guidelines achieved**
- **Much more still to do – agenda agreed & full time help secured!**
- **Torch carriers needed!**



Sustainability in Design Teaching

CRANE

environmental



Queen's University
Belfast

roger@crane-environmental.co.uk

*www.crane-environmental.co.uk, then
go to News and Current Projects*