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

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• 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
  ➢ 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
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
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• 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
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• 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.
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• 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 wI²/8
CEEQUAL – The Civil Engineering Environmental QUALity Assessment & Awards Scheme

www.ceequal.com

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RAEng Guide to Engineering for Sustainable Development

- 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

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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
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.
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
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• 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-permanancy
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• 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?
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• 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!
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roger@crane-environmental.co.uk
www.crane-environmental.co.uk, then

go to News and Current Projects

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