Sustainable Development is an All Engineering Affair

The Role of The Royal Academy of Engineering

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Welcome to Royal Academy of Engineering

The Academy has long considered Sustainable Development to be a high priority and has had a series of initiatives aimed at raising profile of Sustainable Development in engineering. The Profession has now moved one stage further with Sustainable Development enshrined as a competence requirement for Engineers, both Chartered and Incorporated – perhaps putting into formal words the responsibility the best Engineers have, for some time, known was theirs.

So the Academy is very pleased to host this important seminar and I am delighted to be given chance to say a few words and to put what I stress is a personal view.

Only the blindest of blind would not agree that development unfettered by considerations of sustainability will take the world to crisis point - indeed many thinking people consider that we are already heading for the last chance saloon. In face of the exponentially rising pace of development in Asia, crises of all sorts in Africa, destruction of the huge natural resource of the South American rain forests and the continuing pillage of natural resources in the western world - even those who take a more relaxed view (which I think is increasingly difficult to do) must agree the importance of sustainability as a key facet of development.

And amongst all the professions engaged in development of whatever sort, engineering will always be central, Be it at the high tech end of the spectrum – taking advanced science and turning it into economically viable products or services, or at the more prosaic end – developing infrastructure, manufacturing consumer products, managing technology, delivering services to society – society depends totally on engineering and the engineers who develop it.

So we as the servants of society have a responsibility <u>to</u> society to deliver the products of engineering (in its very widest sense) which take into account not just the full range of technological issues but also all appropriate risk and ethical issues demanded by society.

<u>So what do we mean by Sustainable Development and why is the role of the engineer so important?</u>

There are many definitions of Sustainable Development, and I profess no expertise, but a simple definition I understand is that coined by Gro Harlem Brundtland, one-time Prime Minister of Norway and Chair of the **World Council on Environment and Development 1987** which is robust enough for we as engineers to be clear on our role:

> **Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.**

And it would help to be absolutely clear about engineering. There are many different definitions, but I have chosen a couple which are simple, succinct and serve my purpose this morning:

> **E**ngineering is the practice of creating and sustaining services, systems, devices, machines, structures, processes and products **to improve the quality of life;** getting things done effectively and efficiently**.**

[Engineering Council - 2000]

Note the reference to the improvement of the quality of life.

And another simple definition:

> The profession in which knowledge of the mathematical and natural sciences is applied **with judgement** to develop ways to utilize, economically, the materials and forces of nature **for the benefit of mankind.**

Note here the reference to the use of **judgement,** which is applied **for the benefit of mankind.** And this definition includes a context:

> The context is one of **constraints and disciplines, including those imposed by finance, legislation, ethics and people**. At the professional level it requires innovation, creativity and flair in a design process.

So if there is anyone left who thinks that engineering is just about applying science and technology to make things and systems that work – think again.

But I put to you that this is nothing new. There always was a context, and we would expect the context to change over time.

The Victorian engineers in whom the public has developed such an interest (Brunel, Stephenson, Bazalgette) were visionaries, promoters, fundraisers, designers and project managers. They were consummate entrepreneurs. They served society within the context of the day and the development they pioneered drove the improvement of the quality of life, and it was unequivocally for the benefit of mankind. Think Bazalgette and the London sewer system.

And in the same way, we 21st Century engineers must at least be driven by the ethics of today. In fact I would argue that today's engineers should be leading the debate on the ethical concerns that are relevant to development rather than just following them.

So it is our professions intention that engineering activities should be undertaken in such a way that contributes to sustainable development – and that means taking proper account of environmental and social outcomes as well as economic ones.

Looking back with wisdom of hindsight – easy to be critical of past practice, but too many projects that have been implemented by Engineers, and perhaps conceived by them too, have not satisfied today's ethical standards for sustainability.

There are countless examples, and I mention just a few to get us thinking:

1. Starting just over 40 years ago, major irrigation projects were developed in Soviet Central Asia, taking water from the Aral Sea. At the time this was one of the world's biggest inland seas and a major fishing ground. Very quickly, the Aral Sea started to shrink, and is now much less than half the size it was 40 years ago. The fishing grounds have disappeared and many of the farming projects have also failed. Grazing camels are now a more likely sight than fishing boats in what was until recently the middle of the sea!

2. Closer to home - and remember that Bruntland's definition of Sustainable Development included future generations – a future generation in the mining village of Aberfan was wiped out as a result of engineering action that was not carried out responsibly and which did not take proper account of social and environmental outcomes – all in the quest of cheap energy.

3. Twyford Down: 10 years ago was an area of outstanding natural beauty and a site of special scientific interest. Although the M3 extension around Winchester has yielded significant environmental benefits closer to Winchester town centre, we might ask whether it could have been achieved without the undoubted damage done to Twyford Down itself.

4. The Barents Sea to the north of Russia has been used as a dumping ground for radioactive cores from nuclear submarines, and indeed is the resting place also for at least two sunken nuclear submarines. Perhaps the Russians have been less careful than we have, but we too have some challenges with nuclear waste not well handled by previous generations.

5. Even today – the pressures of development in China have led to the massive 3 Gorges Dam project. I make no judgement but the benefits the Chinese extol are counterbalanced by huge social environmental issues and it does raise a lot of questions.

I could go on. Global warming, non-nuclear contamination, rain forest destruction and a host of other problems show us how important this is.

So what does this mean for the engineering profession, and how do we need to develop our skills and knowledge?

- We need to embrace, unequivocally, the social and ethical dimension of what we do

- We need to **look for and work within the context of** the bigger picture and to improve our skills in understanding what the problem really is – the whole problem and not just the technical one

- Take account of the needs of a much wider range of stakeholders, including future generations

- We must work for better decision-making and to provide decision-makers with all the right information to help them make the right decision

- We must help engineers to develop the skills so that not only do they take all the issues into account but are equipped to argue the case on the broadest basis

So where does The Academy fit into all of this:

The Academy is keenly interested in the relationships between engineering, technology and quality of life. We have been engaged in a significant way in issues such as ethics, risk, and the position of the engineering profession within the UK - and we do it by making use of our Fellowship. We have 1250 or so Fellows of the Academy, all of whom are leaders in Industry, Academia or the public sector and well equipped to lead the debate.

The Academy has always applied itself to providing leadership, often in an informal sense, in interdisciplinary issues. Nothing will require a more interdisciplinary approach than Sustainable Development. And the Academy has a certain authority when it comes to speaking on Sustainable Development:

- Immediately after Rio (1992), RAEng adopted Sustainable Development as one of its major programme themes.

- From 1993-97, we organised a series of high level briefings on Sustainable Development to bring opinion formers into the picture, including a seminar series on global warming to brief HMG before Kyoto.

- Since then we have established 2 major research professorships in Sustainable Development at Cambridge and Imperial College.

- We have sponsored 26 universities to start developing curriculum materials that help to develop Sustainable Development competencies (and you will hear more of this later in the programme).

And to conclude:

This is a big challenge, but one that we cannot duck. It will require development of new skill sets for engineers and a focused effort to train young Engineers to understand the requirement. The new UK SPEC is very timely in seeking a change in the way our undergraduates are taught, but we must also develop them in their careers in a manner that means that they take sustainability issues into account as a matter of routine and not just when forced to.

We must also be clear that our profession has a responsibility to take the wider view.

Today is an opportunity for us to share our views and experiences so that we can position the profession in the vanguard of sustainable development.