

What is sustainability?



Prepared by the IStructE Sustainable Construction Panel, this is the first in a series of Briefing Sheets, which will provide engineers with information and knowledge to help implement sustainable solutions.

The Philosophical Basis

Different people and organisations might have a range of views on the definition of sustainability, which is commonly considered to include a balance of environmental, social and financial issues. The Natural Step for example, (www.natural-step.org.uk) uses the metaphor of a funnel to visualise economic, social and environmental pressures putting pressure on society as natural resources diminish and population grows. At its root, sustainability demands that we understand and control the wider impact of human activities for the benefit of future generations. It can be helpful to draw a distinction between sustainable development (the process, or journey), and sustainability, (the aim, or destination).

Environmental sustainability

The Earth's resources are finite, and require careful management. Pressures on environment include:

- population growth
- deterioration in land and soil
- pollution of water
- changing atmosphere (particularly in relation to greenhouse gases)
- reduction in bio-diversity
- sea level and temperature change.

Key considerations include:

- material use (including resource depletion)
- depletion of fossil fuel reserves
- water use (including resource depletion)
- emissions to air and water
- embodied energy and energy in use
- waste disposal.

Sustainability – political motivation

In 1987, the Brundtland report stated – *'Humanity has the ability to make development sustainable —to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs'*¹. Sustainability, and specifically climate change, was introduced into the political arena with the Kyoto Protocol in 1997 and has gained momentum since.

Former US Vice President turned environmental campaigner, Al Gore, has been effective in demonstrating the scientific facts of environmental damage caused by unsustainable living². It is recognised that environmental damage and climate change will

lead to conflict and social breakdown. In the UK, where action has concentrated on climate change and reducing greenhouse gas emissions, sustainability is a hot political issue (<http://www.sustainable-development.gov.uk/>).

Social sustainability

The 'green' agenda addresses the issue of affluence and over-consumption. The so called 'brown' agenda focuses on poverty and under development – the need to reduce the environmental threats to health due to poor sanitary conditions, crowding, inadequate water provision, hazardous air and water pollution, and accumulations of solid waste.

In developed countries social sustainability frequently focuses on social equity, cultural issues, traditions, heritage issues, health and comfort, social infrastructure and a safe and healthy environment. In developing countries the social focus shifts to poverty reduction, job creation and access to safe, affordable and healthy shelter. At the Johannesburg Earth Summit (2002), the three 'P's were coined – 'People, Planet, Prosperity'.

Corporate sustainability

Sustainability is often regarded as good for business. To control costs, and demonstrate competence to their shareholders, many commercial organisations are changing and promoting change within their suppliers.

Drivers for change include politics and legislation, customer pressure and achieving continued and increased profitability. Some businesses have referred to the three P's as 'People, Planet and Profit'.

Economic sustainability

The Stern Review³ examined the economic effect of environmental degradation on the economy, concluding that *'annual emissions of GHGs must be reduced to 80% below current levels for stabilisation'*. The UK Government's economic advisor, Lord Nicholas Stern, argued that *'sustained long-term action can achieve this at costs that are low in comparison to the risks of not acting'*. Without action, he estimated the overall costs and risks of climate change will equate to a loss of at least 5% of global GDP annually, however with immediate action, the costs of reducing GHGs can be limited to about 1% GDP.

Sustainable construction

Construction has an impact on sustainability throughout its life cycle. Sustainable construction can be a major force in redressing the environmental balance. The late David Pearce⁴ defined the construction industry's contribution to sustainability as:

- *Manufactured Capital* – capital stock, construction and

capital formation, longevity of built wealth

- *Human Capital* – labour force, training and skills, productivity, health and safety
- *Natural and Social Environment* – materials balance, energy balance, pollution, benefits of the built environment, sustainable communities
- *Technological Progress* – improved productivity; research and innovation, design and whole-life costing.

Sustainability for engineers

Engineers are implementing the changes needed for sustainability. These include Sustainable Urban Drainage Systems (SUDS) and Sustainable Energy Generation. Issues of particular relevance to structural engineers include:

- enabling change of use
- enabling refurbishment
- design for safe construction and use
- reusing and recycling materials
- reduction of resources through intelligent design
- selection of materials for low environmental impact
- efficiency of material usage
- design for long life and future flexibility
- integrated design with architect and environmental engineer
- design for de-construction.

Being dedicated to process, engineers have an advantage over other professions. Their work moves logically from concept-through scheme design to construction and commissioning. For cost control, the impact on design is considered stage by stage and the same is possible for consideration of environmental impact.

Sustainable development is a new and rapidly changing field.

In 1999, the IStructE report *Building for a Sustainable Future*⁵ was the first coherent study of the implementation of sustainable construction. Still a highly relevant introduction, it is currently being revised by an Institution Task Group. With the publication of these briefing sheets, it is hoped the Institution can continue to support engineers in this critically important field. Engineers can have a direct impact through their design work and, by being well informed, they can influence others in the design process.

Further information: This briefing is prepared by the IStructE Sustainable Construction Panel. Contact: Berenice Chan (email: Berenice.chan@istructe.org). The sustainability area of the website (www.istructe.org/sustainability) includes links to useful websites arranged by category with brief descriptions.

Issue No:1

References

- 1. Brundtland, G. H.: Report for the UN World Commission on Environment & Development, *Our Common Future*, Oxford University Press, 1987, ISBN 0-19-282080-X
- 2. Gore, A.: *An inconvenient truth: The Planetary Emergencyn of Global Warming and What We Can Do About It*, Bloomsbury Publishing plc 2006. Also an American Academy Award-winning documentary film of the same name
- 3. The Stern Review Report: *The economics of climate change*, HM Treasury, 2006
- 4. Pearce, D.: *The social and economic value of construction, the construction industry's contribution to sustainable development*, A report for nCRISP the Construction Industry Research and Innovation Strategy Panel, 2003
- 5. *Building for a sustainable future – construction without depletion*, The Institution of Structural Engineers, November 1999