

Sustainability and Construction

1. Sustainability and the Construction Industry

'Sustainability' is becoming a central concern for us all. It is a concern that has grown out of wider recognition that rising populations and economic development are threatening a progressive degradation of the earth's resources. The Construction, maintenance and use of buildings impacts substantially on our environment and is currently contributing significantly to irreversible changes in the world's climate, atmosphere and ecosystem. Buildings are by far the greatest producers of harmful gases such as CO₂ and this 'eco-footprint' can only increase with the large population growth predicted to occur by 2050. What 'sustainability' means is adapting the ways we all live and work towards "...meeting needs, while minimising the impacts of consumption, providing for people of today and not endangering the generations of tomorrow..."¹.

The UK Government has set out its approach to sustainable development in a White Paper², which identifies four objectives:

- social progress that recognises the needs of everyone;
- effective protection of the environment;
- prudent use of natural resources;
- maintenance of high and stable levels of economic growth and employment.

This approach emphasises that a 'joined up' attitude to all aspects of sustainability is important, as each area overlaps and relates with the others. However, the environmental and resource elements of this sustainability equation are particularly important for the construction industry which draws materials directly from natural resources, uses highly energy intensive processes, removes land from other uses, and is responsible for designing and making products that have a lasting effect on the needs of their users.

For all these reasons the construction industry will come under the particular scrutiny of government, the consumer and environmentalists. This will affect every stage of the construction process, from planning and design to assembly, operation and disposal, and it will affect all members of the industry, from small building firms to large construction companies.

Until recently, the challenge of sustainability has not been fully understood nor taken up by the industry. A lack of long-term perspective, resistance from the public to the idea of buildings having a different appearance and function, and ambiguities in the very idea of sustainable development have all caused suspicion. There has been a lack of transparency and co-operation within the industry, not to mention a failure to realise the potential benefits at stake, which has led to the view of 'sustainability' as another policy-driven burden.

In fact, sustainable development is not just another social or environmental policy; it is a business opportunity too. Reviewing their activities with a more sustainable perspective, construction businesses could go beyond reducing detrimental environmental impacts. In many cases they will also benefit from improved and more profitable operation, as well as an enhanced reputation both in the community and with customers.

An enduring long-term regard for 'sustainability' as a way of business is essential to the future of the construction industry and could benefit individuals as well as contributing to global solutions. Disregarding social and environmental issues is not only damaging to the planet, but will ultimately inhibit the healthy progression of business. As the Sustainable Construction Task Force³ have asserted, "Sustainability issues are of critical and strategic importance to business...Ignore sustainability and your reputation is on the line."

¹ Davoudi and Layard, 'Sustainable Development and Planning', in *Planning for a Sustainable Future*, Batty, Davoudi and Layard (Eds), Spon Press, London, 2001.² *A Better Quality of Life*, available at www.sustainable-development.gov.uk

³ From the report, *Reputation, Risk and Reward: The Business Case for Sustainability in the UK Property Sector*, available at <http://projects.bre.co.uk/rrr/RRR.pdf>

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2. How the Construction Industry can move towards Sustainable Development

The starting point for all members of the construction industry that wish to approach sustainability as a business opportunity – from big developers to small companies and those who refurbish existing buildings – must be to re-think their operations in four key areas:

- **Energy:** reducing energy consumption, being more energy efficient and using renewable energy and 'alternative technology'.
- **Materials:** Choosing, using, re-using and recycling materials during design, manufacture, construction and maintenance to reduce resource requirements.
- **Waste:** Producing less waste and recycling more.
- **Pollution:** Producing less toxicity, water, noise and spatial pollution.

This will lead on to a re-assessment of best practice in each area, with cumulative benefits from overlapping improvements between the areas. The implementation of those results could improve profits and investment, and will contribute towards a sustainable future for the construction industry.

Of course, it would be as wasteful as some current construction practices for every firm to go-it-alone. Co-operation, through industry bodies, with government, and transparency in what we are doing, can all help reduce the burden of change. But in the end change will come only when individual firms take up the challenge of operating in a sustainable way.

For further practical advice on what firms can do in each area to improve their 'sustainability' please read the subsequent sections of this advice relating to each of the above headings.

3. Implementing Changes for a more Sustainable Future

The practical implementation of sustainable development will vary according to the position of each firm within the construction industry, and the demands of their stakeholders. Here are some suggested action points:

Larger construction companies:

- Consider the needs of your stakeholders. Talking to your investors, suppliers, employees and consumers is part of the process towards defining a sustainable future.
- Think long-term. Consider what sustainability will mean for you and your stakeholders in five, ten or twenty years time.
- Have a wide outlook. Once you have begun to implement the progression towards a more sustainable future internally, look to implement it externally, i.e. are all your suppliers committed to sustainable development? Their reputation in the sustainability stakes could affect yours both positively and negatively.
- Learn from companies who have already started to address sustainability in policy making and reporting, such as Shell and BP Solar (non construction) and Carillion (construction specific). Greater collaboration and transparency is important. (See the following websites: www.shell.com, www.carillionplc.com/sustain-2001, www.bp.com/environ_social/environment/sus_develop/our_position).
- Devise policies, strategies and long-term plans for the implementation of sustainability, with the help of a consultant where necessary. Rethink site and management practices. The long-term benefits will often cancel out any short-term cost.
- Find out about government funds and assistance schemes, such as 'Envirowise' (www.envirowise.gov.uk) and 'The Green Technology Challenge' (www.hm-treasury.gov.uk).
- Consider how you could begin to report on your targets and in the future, on your achievements. You will increasingly be required to demonstrate your environmental and social credentials in order to secure investment and get preferential status on bids. Producing reports on sustainability could also earn you a place in FTSE4Good or the Dow Jones Global Sustainability Index (DJGSI).

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Small and Medium sized building firms:

- Talk to your suppliers about where and how materials are sourced, try to achieve a balance between the benefits of using renewable resources and energy and the cost of doing so. It should often be possible to achieve long-term profit from short-term outlay.
- Ensure that operatives and site staff are trained to understand the importance of minimising waste, energy use and pollution during construction.
- Engage with the local community and be more transparent. Consider visiting the local school or producing a simple newsletter for door-to-door distribution, explaining the potential effects and benefits of future projects.
- Consider ways in which you can implement the sustainable policies of larger companies on a smaller scale in your own business.
- Try to include sustainability issues in long-term plans as a way of business that could lead to enhanced profit and investment, not just as environmental and social policies.
- Consider your reputation with local government, consumers and media. Could publicising your plans to develop the sustainability of your business and site procedures enhance it?

4. Measuring and Reporting on Sustainability

In order to benefit and profit from becoming more sustainable, it is necessary to report on what you have achieved, and / or what you plan to achieve. Environmental and social policy is becoming increasingly important to the Government, the media, pressure groups, investors, consumers and clients. Therefore reporting on the evolving sustainability of your business can give you a competitive advantage over companies not yet addressing the issue. Furthermore, measurement is fundamental to progress as it is important to recognise and learn from changes that have been implemented. Advice and guidance on how to measure, quantify and report on your progress in sustainable development can be found at the following sources:

- CIRIA have undertaken a project looking at performance indicators. Details about the CIRIA guide C563 'Sustainable Construction: Company Indicators', published 2001 can be found at www.ciria.org.uk.
- The Global Reporting Initiative (GRI) "...seeks to make sustainability reporting as routine and credible as financial reporting in terms of comparability, rigour and verifiability". Details of the guidelines and companies who report using them can be found at www.globalreporting.org.
- The government have a website that advises on environmental reporting. Visit www.defra.gov.uk/environment/envrp/index.htm.

5. Further Information

Further reading about Sustainability and its implementation in the construction industry, case studies and examples of best practice can be found at the end of this document, or visit our website at www.ciob.org.uk. CIOB members can also search for publications on sustainability and any other construction related topics in the CIOB library database at www.ciob.org.uk/members_area/index.jsp.

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Energy

45% of energy generated is used to power and maintain buildings, and 5% to construct them.

The heating, lighting and cooling of buildings directly through the burning of fossil fuels (gas, coal, oil) and indirectly through the use of electricity is the primary source of Carbon Dioxide and accounts for half of all global warming gas emissions.

How does the Construction Industry consume Energy?

Consider the 'embodied' energy in every brick in every structure. Every brick has used energy at every stage in its production and use. Energy is consumed when:

- Extracting raw materials.
- Producing materials (Manufacturing process).
- Transporting materials.
- Transporting workforce.
- Building structures.
- Using and powering structures.
- Maintaining structures and demolishing structures.

How can the Construction Industry have a more Sustainable Approach to Energy?

By reducing energy consumption, being more energy efficient and using renewable energy and 'alternative technology'. More specifically:

- Go back to the design process and create more energy efficient designs, considering the energy required for humans to use buildings.
- Seek to make existing buildings more energy efficient.
- Use local materials/workforce/energy to reduce transport.
- Use more low energy/energy saving materials.
- Recycle more in order to save the energy used to transport and dispose of waste, and to save the energy of manufacturing new materials.
- Consider how to use renewable energy sources (solar, wind, geothermal, bio fuels, etc).
- Physically orientate buildings to maximise their capacity to exploit renewable energy.
- Consider how to use 'alternative technology'; see www.cat.org.uk for ideas.

Useful Resources

- www.energy-efficiency.gov.uk (news, events, advice and best practice).
- www.actionenergy.org.uk (advice on improving energy efficiency to save money).
- *Making Energy Work*, Reeves J (ed), London: Caspian, 2002. *
- *Rough Guide to Sustainability*, Edwards B and Hyett P, London: RIBA Companies Ltd, 2001. *
- *Best Practice Advice In Energy Efficient Design*, Video accompanied by a 4-page booklet, London Television Education Network, 1998. *

* Available to members from the CIOB Library, contact lis@ciob.org.uk or go to www.ciob.org.uk/members_area/index.jsp.

See our list of further reading and websites for more general information on sustainability.

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Materials

Around 50% of all global resources go into the construction industry, with a specific example being that 70% of all timber is used for building. (Edwards and Hyett, see further reading list for details). It is therefore very important that a sustainable approach to choosing and using materials is adopted, in order that the industry can meet the target of, '...providing for people of today and not endangering the generations of tomorrow...'

The environmental and economic benefits of sustainability are inherently linked when considering building materials, due to the long-term financial advantages of recycling, using recycled products and sourcing heavy materials locally.

How to Choose and Use Materials in a more Sustainable way

A variety of decision-aiding tools exist, which can help to evaluate the environmental cost of a manufactured product in the context of social and economic benefit. These include Life-Cycle Assessment, Eco-Labeling and Embodied Energy Audits, all of which could help when choosing materials and suppliers to assess the balance between short-term costs and long-term environmental, social and financial benefits.

There are also some other considerations to take into account when re-evaluating the way in which materials are used in construction:

- What reserves are left of our materials, and how can their complete successive depletion be prevented?
- What are the pollution impacts of the manufacturing process involved with creating new materials?
- How can existing materials be recycled? (roof tiles, bricks, timber, etc.).
- How can more recycled and reclaimed materials be used effectively in design and construction?
- Could materials be designed and used in a way more conducive to re-use?
- How much energy is consumed in the transport of materials? (try sourcing heavy, bulky materials locally and lightweight materials globally).
- Can more prefabricated components be used? (reduces waste and dust on site).
- How can more natural building materials be incorporated practically into design and construction? (earth products, stone, timber, lime, organic insulation, and water-based paints).
- How can more low maintenance materials be used in order to reduce further energy and resource use in the future of the building?

Useful Resources

Ecology of Building Materials, Berge B, Oxford: Architectural Press, 2000.

Green Building Handbook Vol II: A Guide to Building Products and their Impact on the Environment, Wooley T, Kimmins S, London: E & FN Spon, 2000.

Green Guide to Specification: An Environmental Profiling System for Building Materials and Components, Anderson J et al, Oxford: Blackwell Science, 2002.

Hazardous Building Materials: A Guide to the Selection of Environmentally Responsible Alternatives, Curwell S et al, London: Spon, 2002.

All are available to members from the CIOB Library, contact lis@ciob.org.uk or go to www.ciob.org.uk/members_area/index.jsp.

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Pollution

There are many types of pollution associated with the construction industry, including dust and noise pollution, water pollution and toxicity.

50% of all global warming gas emissions and CFC use is related to buildings. (Edwards and Hyett, see further reading list for details).

The impact of gaseous emissions such as CO₂ and CFC's on global warming and the thinning of the ozone layer has severe adverse effects on human life.

The pollution of water has a serious detrimental impact on the environment. The Environment Agency has stated that the construction industry is responsible for 600 water pollution incidents per year.

Pollution is therefore an issue that must be reconsidered and reassessed by any member of the industry aiming to be more sustainable.

What are the main Pollution problems in the Construction Industry?

- Gaseous emissions; substances that reduce the Ozone layer and Green House Gases, such as CFC's, HCFC's and CO₂.
- Loud/prolonged periods of noise.
- Dust (produced through industrial processes, incomplete combustion, materials such as asbestos).
- Spillage of hazardous materials or acid substances into surrounding water sources/ systems/habitats.
- Smog (photochemical oxidizing agents).

How can the Construction Industry take a more Sustainable approach to Pollution?

- Dispose responsibly of ozone depleting substances; use official CFC banks, etc.
- Research into the use of materials that do not emit harmful gases, radiation or dust and try to use less of those that do.
- Increase on-site management of storage in order to reduce spillage and leaks.
- Increase recycling and practice more efficient purification of industrial waste.
- Reduce transport; use local materials, manufacturing and labour when cost effective.
- Use more replaceable resources when possible, such as timber.
- Be aware of local environmentally sensitive sites, practice habitat restoration where necessary.

Useful Resources

- www.thecarbontrust.co.uk (advice on reducing carbon emissions).
- www.roads.dft.gov.uk/cv/index.htm (advice on cutting down vehicle emissions).
- www.dti.gov.uk/ccpo (Climate Change Projects Office).
- *Guidance on the Costing of Environmental Pollution from Construction*, Postle M, Vernon J, London: CIRIA, 2001.
- *Basic Tips for Pollution Prevention on Site*, London, Construction Confederation, 2001.

Both publications are available to members from the CIOB Library, contact lis@ciob.org.uk or go to www.ciob.org.uk/members_area/index.jsp.

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Waste

“Sustainable waste management means using material resources efficiently, to cut down on the amount of waste we produce. And where waste is produced, dealing with it in a way that actively contributes to the economic, social and environmental goals of sustainable development.”

DETR, 1999. (Davoudi and Layard, see further reading list for details.)

How much Waste does the Construction Industry Produce?

The Construction Industry Research and Information Association (CIRIA) have reported that an estimated 72.5 million tonnes of construction and demolition waste are produced annually. This is around 17.5 % of the total waste produced in the U.K. Furthermore, 13 million tonnes of construction materials are delivered to sites in the U.K. and thrown away unused every year. This is not sustainable.

How can we Reduce this level of Waste Production?

- Design to minimise waste generation; consider the long-term impacts of design decisions to ensure optimum resource/material use and recycling opportunities.
- Increase the efficiency of the production process, in order to generate less waste – use ‘just in time’ ordering where possible to prevent the wastage of unused materials.
- Step up recycling; recycle wherever possible to produce materials and energy.
- Educate all staff, especially on site, to maximise their understanding and their capacity to reduce waste and increase recycling.

Why should Construction Managers be interested in Reducing Waste?

The long-term benefits of a more sustainable approach to waste are not just environmental. Cost savings are a realistic aim if you are creating new resources from your waste and have less waste to dispose of.

The ability to report annually on targets and achievement in the management of waste will enhance reputation with some stakeholders, especially pressure groups and the public, and often with investors.

Furthermore, the Government is cracking down on waste production, with the landfill tax and aggregates levy being two charges that are in place to encourage better waste management.

Useful Resources

- *Demonstrating Waste Minimisation Benefits in Construction*, Coventry S et al, London: CIRIA 2001. *
- *Tools for Measuring and Forecasting Waste Generated on Site*, Kwan J et al, London: CIRIA, 2001. *
- *Waste Minimisation in Construction Training Pack*, includes booklet, video, CD ROM, site guide, etc. London: CIRIA 2001. *
- *Recycling Construction Waste*, Video accompanied by 14 page booklet. London Einstein Network, 2001. *
- Consider also looking at the policy and aims of other construction industry members, such as Carillion, who show a landfill waste target in their 2001 Sustainability Report, and outline how far they have progressed towards it. For further details go to: www.carillionplc.com/sustain/sust.htm.

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Further Reading:

Batty S, Davoudi S and Layard A (Eds.) *Planning for a Sustainable Future* (London: Spon Press, 2001).

Cox J, Fell D and Thurstain-Goodwin M *Red Man, Green Man* (London: RICS Foundation, 2002).

CIRIA Guide C571: *Sustainable Construction Procurement. A Guide to Delivering Environmentally Responsible Projects* (London: CIRIA, 2001).

Ding G and Langston C (Eds.) *Sustainable Practices in the Built Environment* (Oxford: Butterworth-Heinemann, 2001).

Edwards B and Hyett P *Rough Guide to Sustainability* (London: RIBA Companies Ltd, 2001).

Edwards B and Turrent D (Eds.) *Sustainable Housing Principles and Practice* (London: E & FN Spon, 2000).

Falk N and Rudlin D *Building the 21st Century Home: The Sustainable Urban Neighbourhood* (Oxford: Architectural Press, 1999).

Mawhinney M *Sustainable Development: Understanding the Green Debates* (Oxford: Blackwell Science, 2002).

Most of these books and many more are available to CIOB members from our library, based at Englemere in Ascot. Enquiries may be made by telephone: 01344 630741, by email to lis@ciob.org.uk, or in person between 9.30am and 4.30pm (telephone to check availability).

Useful Websites:

Advisory Committee on Business and the Environment: www.defra.gov.uk/environment/acbe/default.htm.

Building Research Establishment: www.bre.co.uk

Construction Best Practice Programme: www.cbpp.org.uk

Considerate Constructors Scheme: www.ccscheme.org.uk

Construction Industry Council: www.cic.org.uk

Construction Industry Environmental Forum: www.ciria.org.uk/cief

Construction Industry Research and Information Association: www.ciria.org.uk

Department of Trade and Industry: www.dti.gov.uk/sustainability

Earth Summit Website: www.earth-summit.net

Environmental Data Interactive Exchange – has sustainability directory: www.edie.net

Forum for the Future: www.forumforthefuture.org.uk

International Centre for Trade and Sustainable Development: www.ictsd.org

Internet register of recycling sites: www.ciria.org.uk/news_220502.htm

National Council for Sustainable Development: www.ncsdnetwork.org

Office Scorer – a tool developed by BRE and funded by DTI to investigate the long-term sustainability of refurbishing and redevelopment of office buildings. It compares the environmental and economic impacts of major or complete refurbishment with complete redevelopment, and redevelopment with an existing façade: www.officescorer.info/

RICS Foundation: www.rics-foundation.org

Sustainable Building 2002 (Website of the International Conference that took place in Oslo from 23-25 September 2002: www.sb02.com).

Sustainability Works: www.sustainabilityworks.org.uk

Sustainable Development – the Government's approach: www.sustainable-development.gov.uk

World Business Council for Sustainable Development: www.wbcsd.org

World Wide Web Virtual Library: Sustainable Development: www.ulb.ac.be/ceese/meta/sustvl