



Built Environment Technology Year 3

Can construction be
sustainable?



The Impact of the Built Environment

“...when it comes to technology, reality must always take precedence over public relations. Nature cannot be fooled.”

Richard Feynman

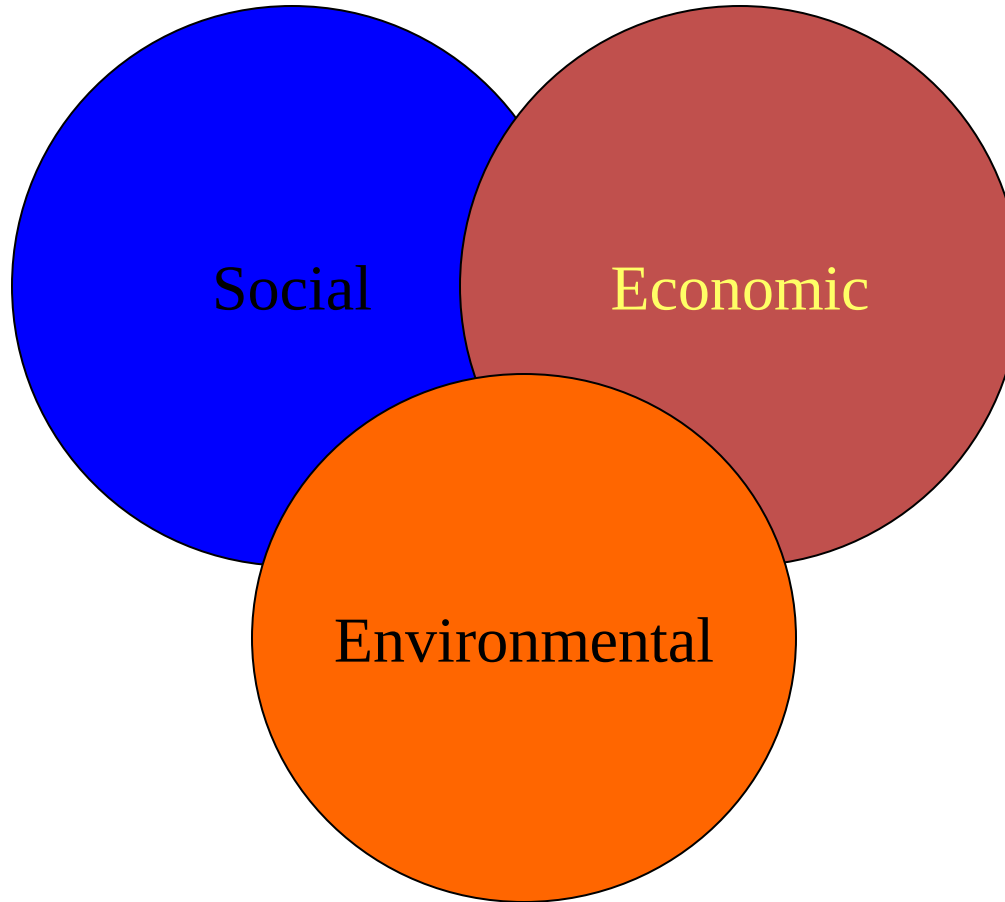
Sustainable Construction



- Building a better quality of life: a strategy for more sustainable construction

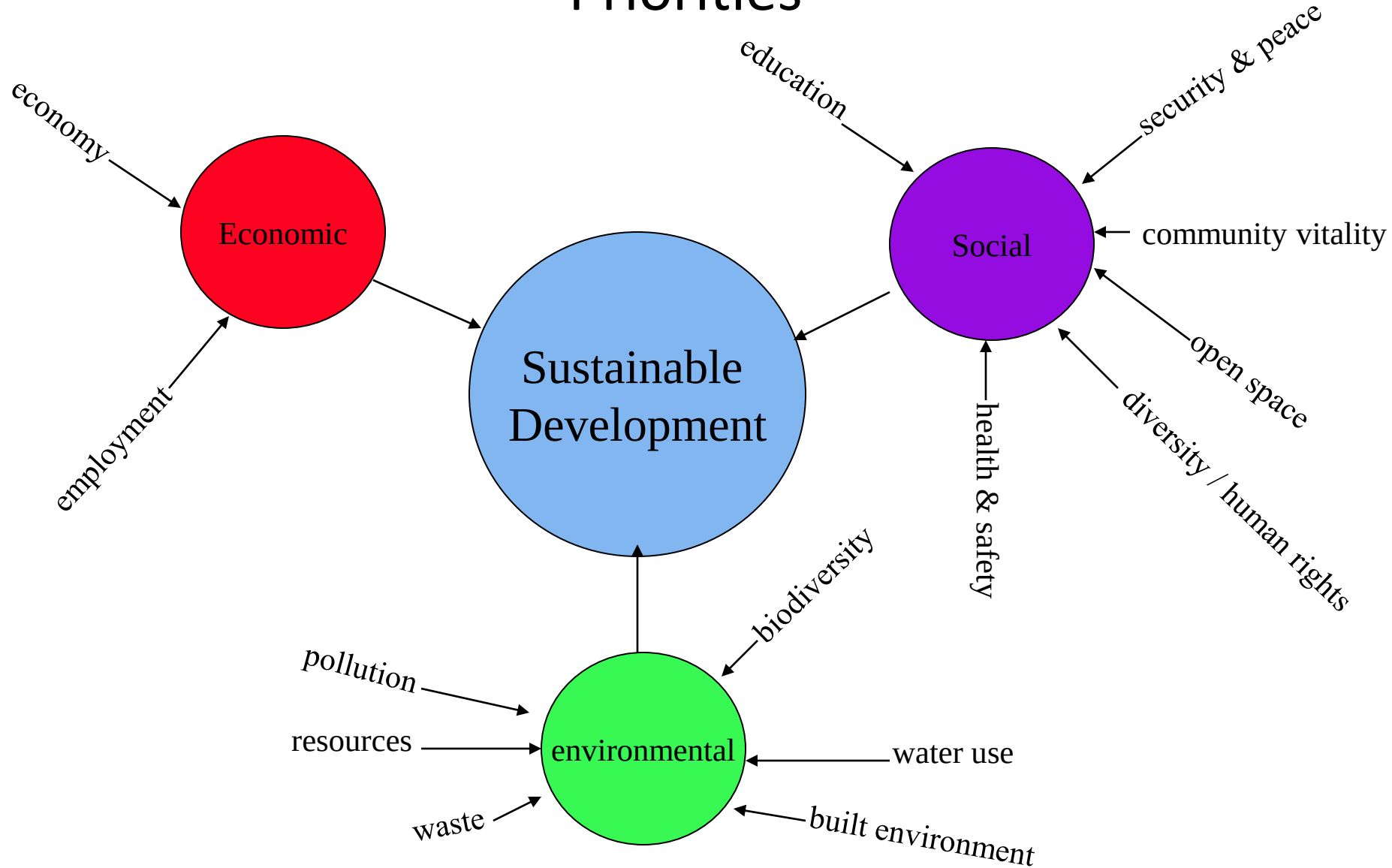
The emphasis delivered by this strategy was on the construction industry's production of buildings which promote economic growth, protect the environment and make prudent use of natural resources.

The Main Pillars of Sustainable Development



So, where does construction fit?

Construction's Sustainable Development Priorities



Sustainable Construction

The government proposes that the industry can contribute to the achievement of sustainable development by:

- being more profitable and more competitive;
- delivering buildings and structures that provide greater satisfaction, well-being and value to customers;

Sustainable Construction

- respecting and treating its stakeholders more fairly;
- enhancing and better protecting the natural environment;
- minimising its impact on the consumption of energy and natural resources.

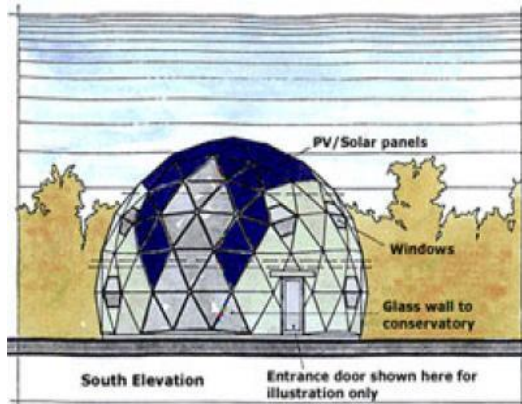
Sustainable Construction, a definition:

“...is conducting business in a way that meets environmental and social responsibilities whilst at the same time improving profitability.”

Construction Best Practice Programme



An Intelligent Building is:



'a building that is able to respond continuously to the needs of its environments, and its occupants in a cost-effective way.'

Sustainable construction is built on the need for integration involving all key players:

those who develop

those who produce

those who plan

those who build

those who alter and maintain

those who design and those who

use the built environment





To achieve effective protection of the environment and prudent use of natural resources, construction will need to action key environmental issues:

- Reduce carbon dioxide emissions.
- Reduce consumption and leakage of potable water during internal use in buildings.
- Reduce the amount of material extracted from the land.

Reduce



Promote

- Reduce the amount of construction and demolition materials and other construction waste going to landfill sites.
- Limit urban sprawl and the use of greenfield sites.



Minimise the ecological impact of development, maximising the enhancement of sites for both new and existing buildings.

Eden opens the biomes



Case Study: Green Roofs



Why have a green roof?

- Water retention
- Climate control
- Life expectancy
- Pollution control
- Thermal insulation
- Space use
- Encourages natural habitats



Some Barriers!



Structural issues

Maintenance

Guidance and support

Guarantees

Aesthetics

Research: the Swiss experience



Local substrates

Depth variation

Planting

Biodiversity



Green roofs



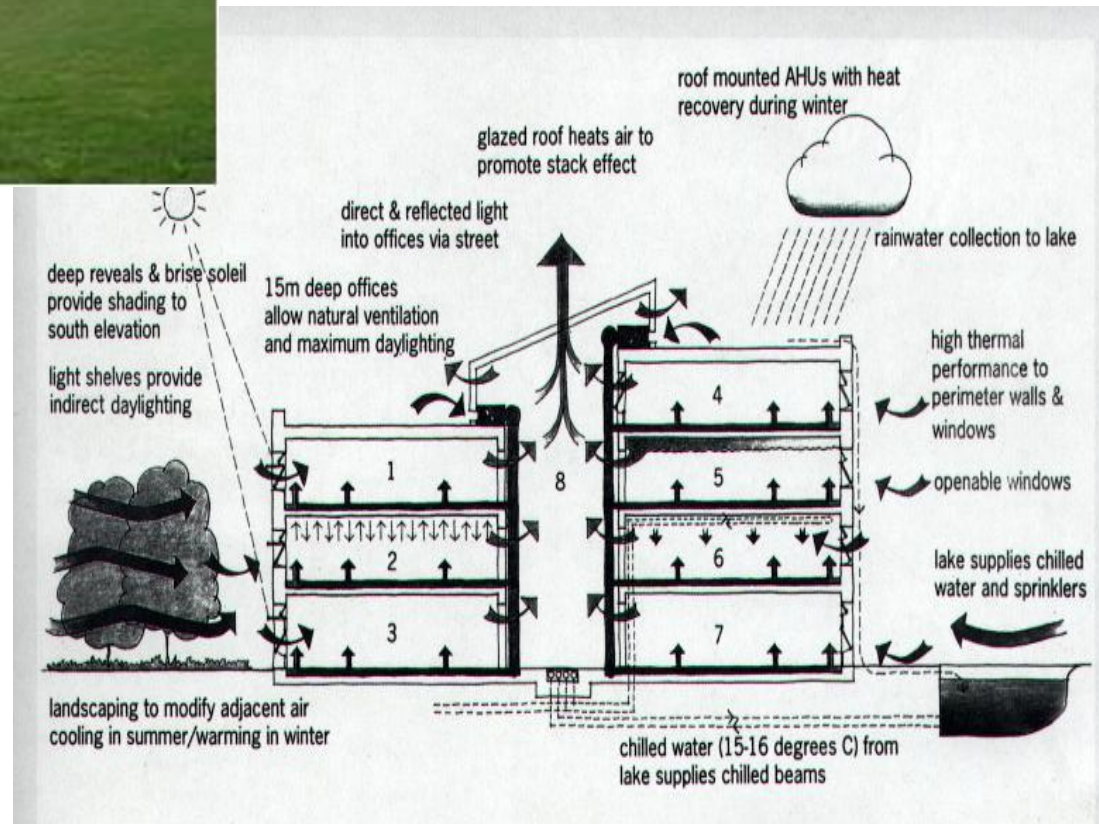
Why Sustainable Construction?

- About 50 % of the UK's CO₂ emission is due to energy used for heating, cooling and lighting in buildings.
- Some 24% of all UK energy is consumed in manufacturing and transporting building materials.
- Approximately 22% of CO₂ results from energy used by building occupants travelling between buildings.



Barclaycard HQ Northampton

Designed to create a healthy, responsive environment for staff



Measures for Reducing Energy Consumption

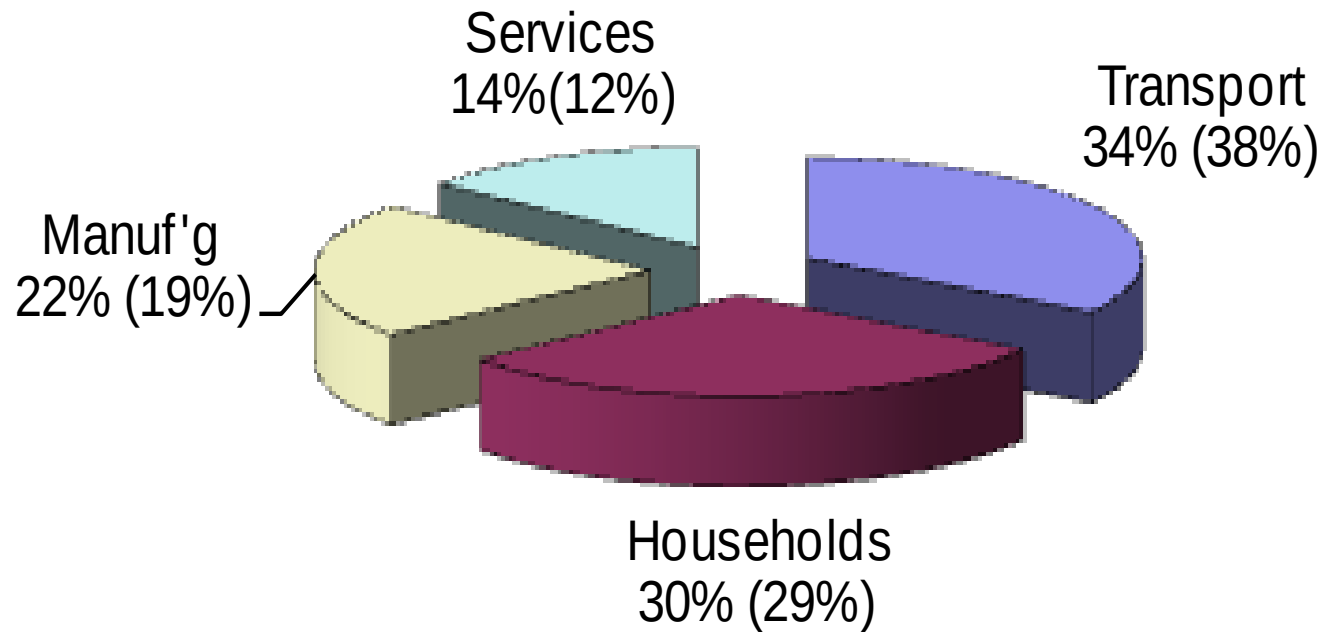
- Improvements in energy efficiency
- Higher efficiency in household electricity use
- Higher efficiency standards for new housing
- Taxation on vehicles, fuel, road use and workplace car parking
- Carbon tax



Measures for Reducing Energy Consumption

- Taxation-the climate change levy
- Negotiated agreements between the government and industry
- Regulation - the IPPC Directive
- Environmental permitting
- Carbon trading
- Advice and information
- The '*have a go*' factor!

Final Use of UK Energy as % Usage



Source: dti 2001
(Dept Energy & Climate Change 2009)

Why Sustainable Construction?

- The construction industry accounts for around 30% of all UK controlled waste arising each year (over 100 million tonnes is construction and demolition waste).
- Approximately 17% of landfill waste is directly related to construction (indirect arisings, such as quarrying and other waste, probably doubles this figure).

Why Sustainable Construction?

Water consumption has risen as much as 70% over the last 30 years. Some 30% of potable water in buildings could be saved by technical and management options.



Whenever buildings are constructed there is always a risk to local ecology / areas of natural beauty.

Why Sustainable Construction?



In 1990 10% of England was urban. By 2010 that this figure rose to 12% or more.

Some 260 million tonnes of minerals are used by UK construction firms each year.





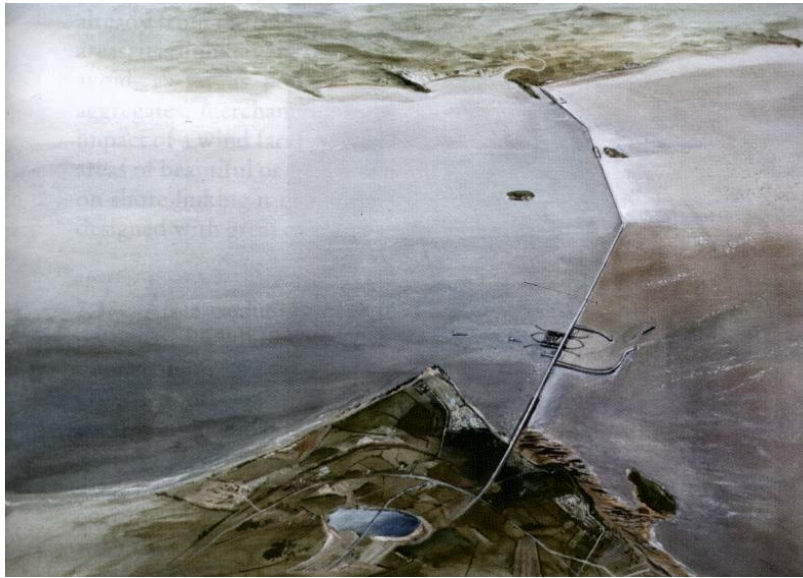
*Wessex Water Operations Centre,
Architect - Bennetts Associates*

A steel frame with a 15m width floor plate allows natural ventilation. The external steel and aluminium screens create an external arcade and act as solar shades. Thermal mass within the floor structure provides sufficient night cooling.



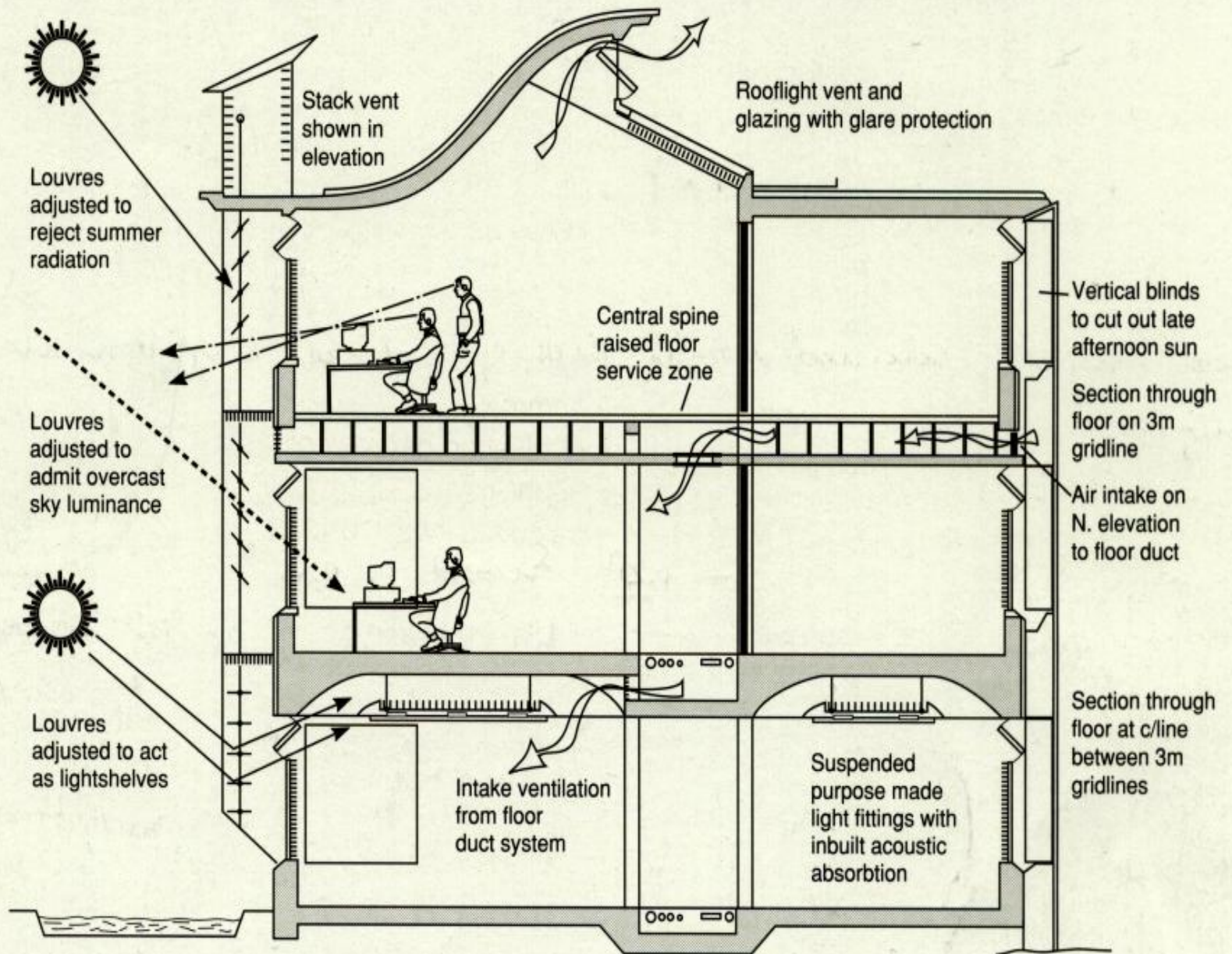
*Arup Campus, Blythe Valley Park, West
Midlands*

'Buildings should be considered as a warehouse of its parts. Treating the individual components as being 'hired' rather than 'used' will encourage a philosophy of re-use.' (Image courtesy of Arup Associates)



Reducing Energy Use





Beddington Zero Energy Development



Making Workplaces Better Places to Work

- Management
- Diversity
- Character, quality and continuity
- Adaptability
- Ease of movement and legibility
- Sustainability



Source: Cabe 2005



Better Places to Work

Chiswick Park, London

Source: Cabe 2005



Better Places to Work



**North Wiltshire District
Council, Chippenham**

Source: Cabe 2005





Earthship Brighton



Earthship Brighton



Tyre bale use in embankments



- First UK use
- Alternative to concrete
- Improved drainage and slope stabilisation
- Environmental impact reduced
- Cost and environmental benefits



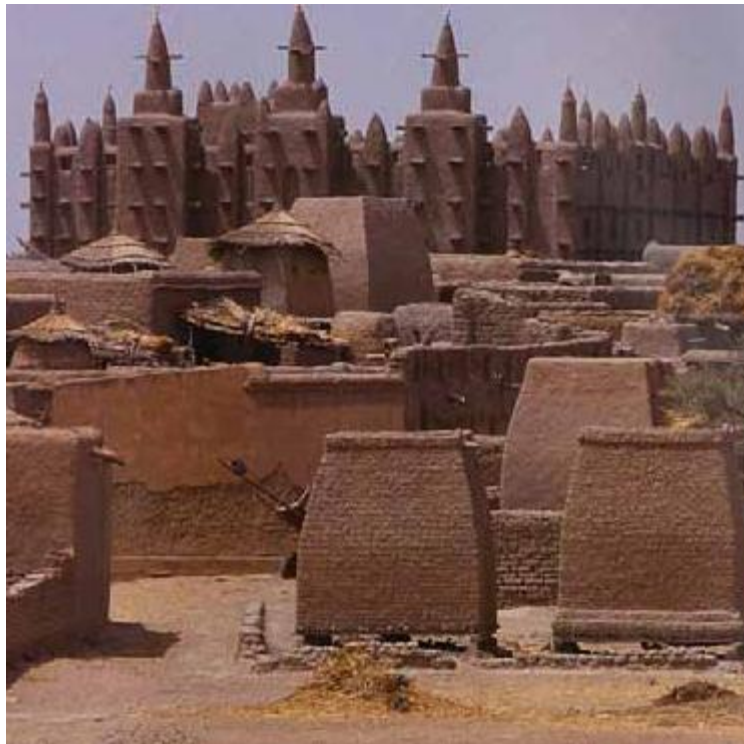
**Wind farm at Blyth Harbour
Northumberland. The
installation has a capacity of
2.7MW from nine 300 kW
turbines.**





'With sustainable development becoming fashionable, it is important that we learn from those often unrecognised, undervalued initiators who have been experimenting with sustainable buildings and services since the 1960's'

Howard Liddell
Gaia Architects





Murray Grove Housing, Hackney, London
Cartwright Pickard Architects

Innovative light steel-framed social housing project on a brownfield site in North London. Modular construction using prefabricated units delivered to site with services, finishes, kitchens and bathrooms pre-installed. Fast construction time with assembly of main units in 3 weeks.



Baglan Energy Park industrial building

Built on reclaimed industrial land, this air-tight, steel-framed and steel-clad building was constructed using local steel suppliers.

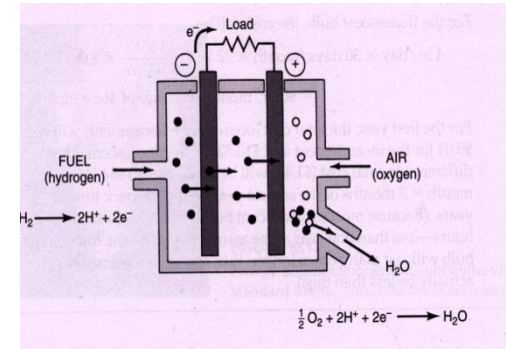
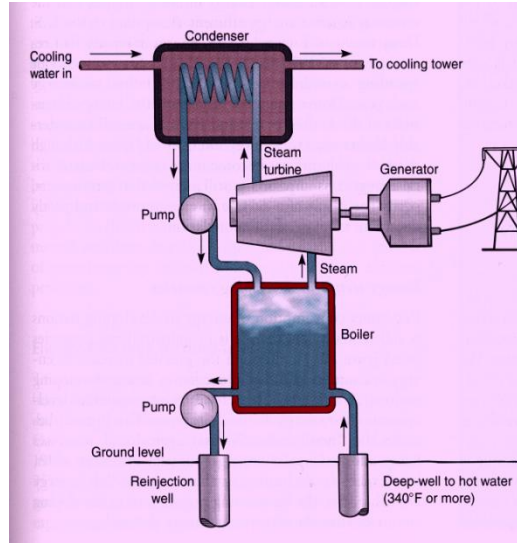


National Space Centre, Leicester
Architect - Nicholas Grimshaw & Partners

Brownfield site redevelopment involving the reuse of a buried storm water tank. The lightweight, steel frame provides flexibility to accommodate changing exhibition display systems.

Can construction be sustainable?

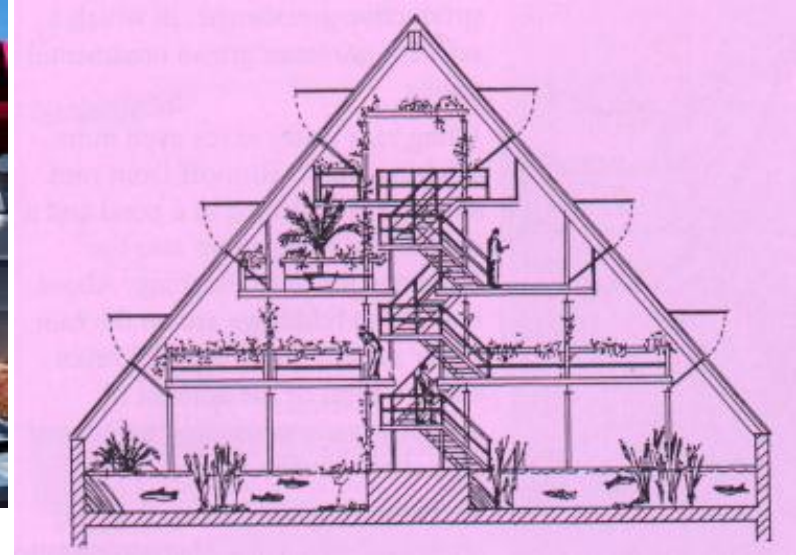
- Simplicity
- Orientation
- Lighting efficiency
- Flexible design
- Energy conservation
- Avoid oversizing
- Waste management
- Good quality air





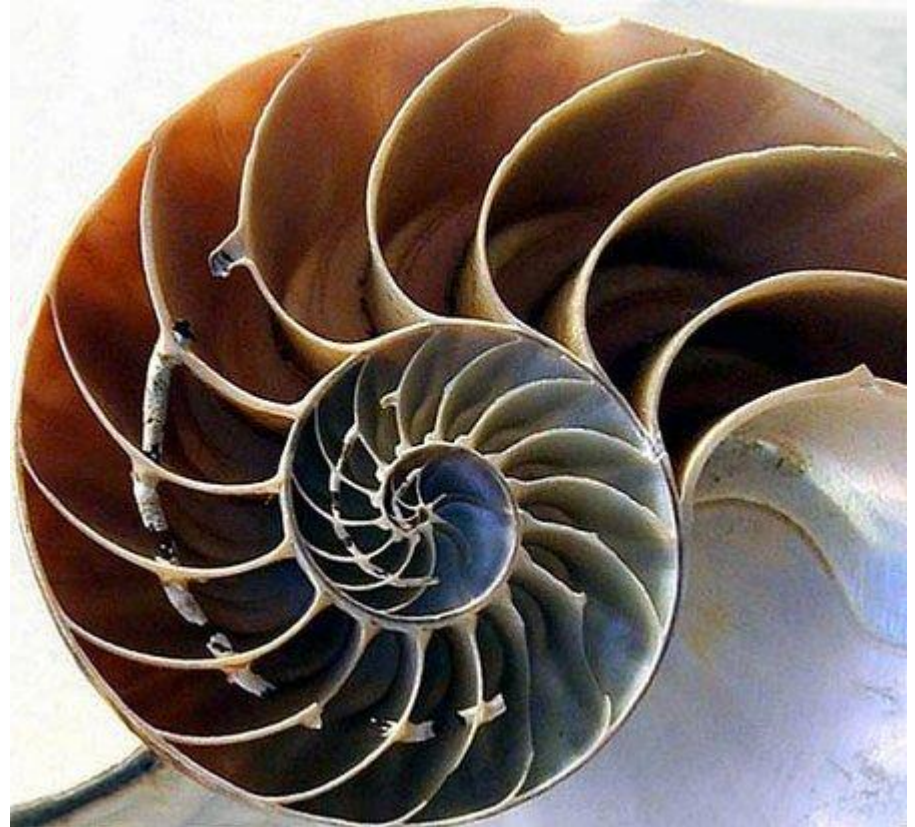
Can construction be sustainable?

- Passive design
- Native landscape
- Attention to power
- Water conservation
- Reduction of emissions
- Design for operation and maintenance
- Materials efficiency
- Design for recycling



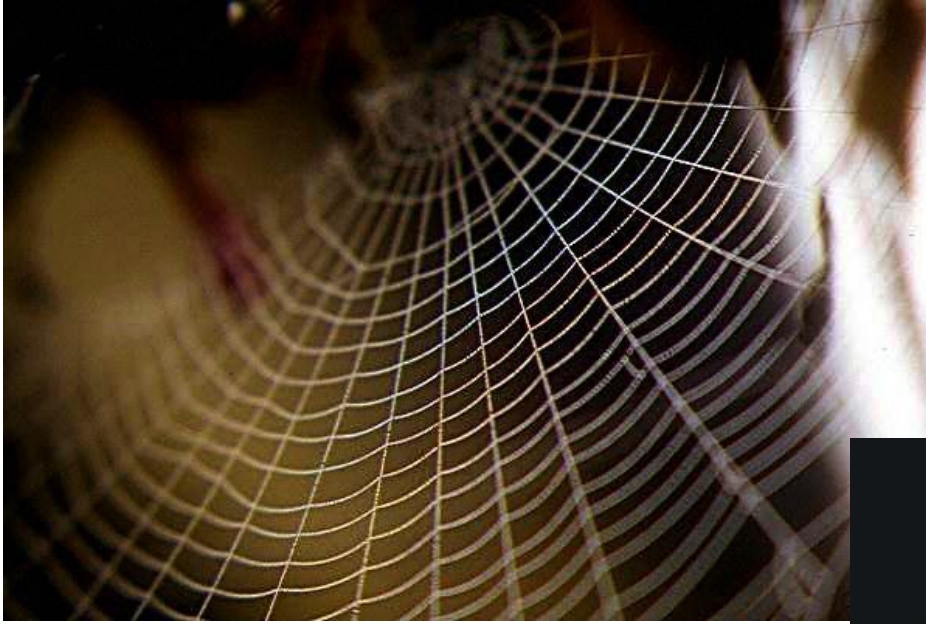
Sustainable construction?

- Design for minimum waste
- Lean construction & minimise waste
- Minimise energy in construction & use
- Do not pollute
- Preserve & enhance biodiversity
- Conserve water resources
- Respect people & local environment
- Monitor & report, (ie use benchmarks)



Sustainability and the Revolution in Design ...

Sustainable design

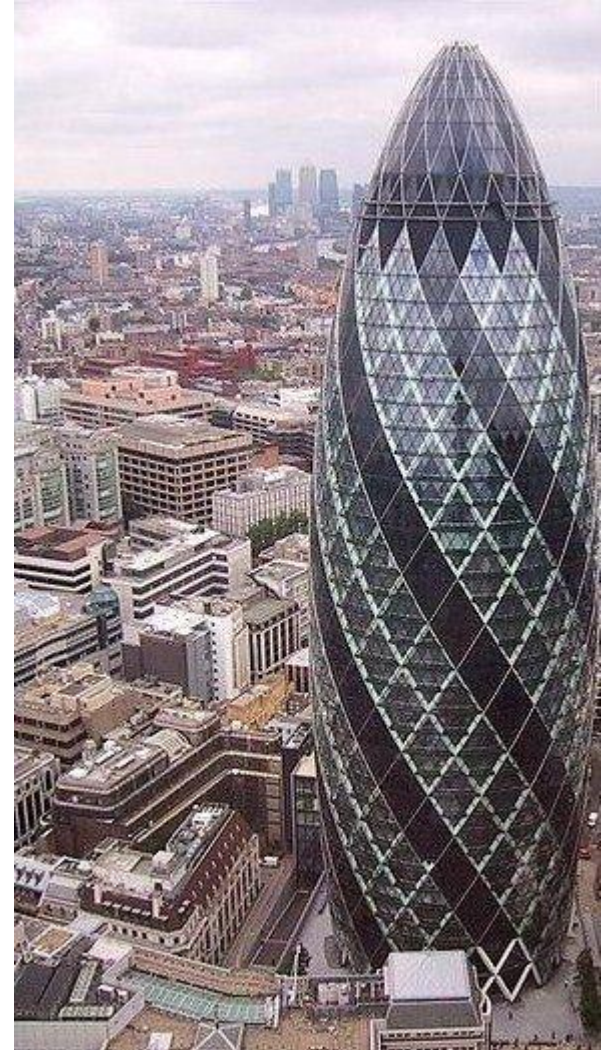


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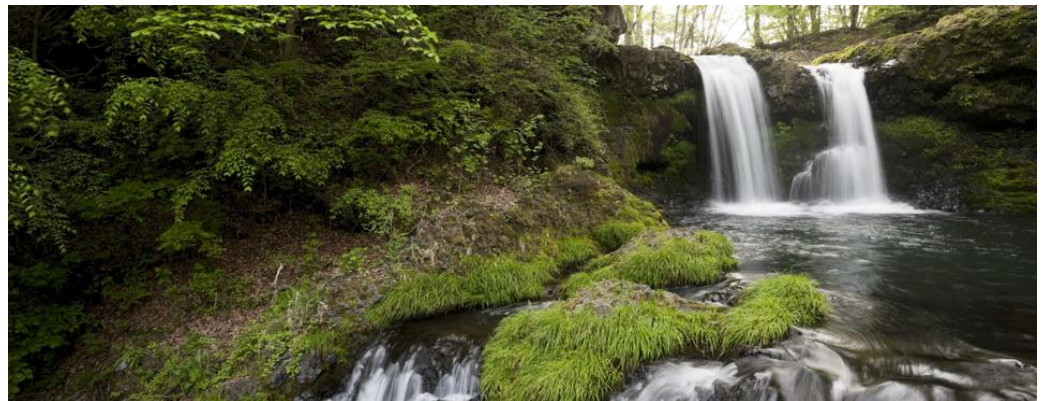
To this

Sustainable design



Linking sustainable construction to SD

- The five capitals model
 - Natural capital
 - Human capital
 - Social capital
 - Manufactured capital
 - Financial capital



Defining Sustainable Development



- Triple-bottom line
- Forum for the future
- Natural step

Balancing the natural with the built!



Now, we did
say sustainable,
didn't we?

Tutorial

- Can the construction industry be truly sustainable?
- The Royal Commission on Environmental Pollution have concluded that the UK should agree to cut its carbon dioxide emissions by 60% by 2050.
Explain how construction can assist in helping to achieve this target.
- Is it possible for the construction industry to deliver ecological design?