

Designing Waste out of Construction

Effective and Efficient Processes

Designing Waste out of Construction

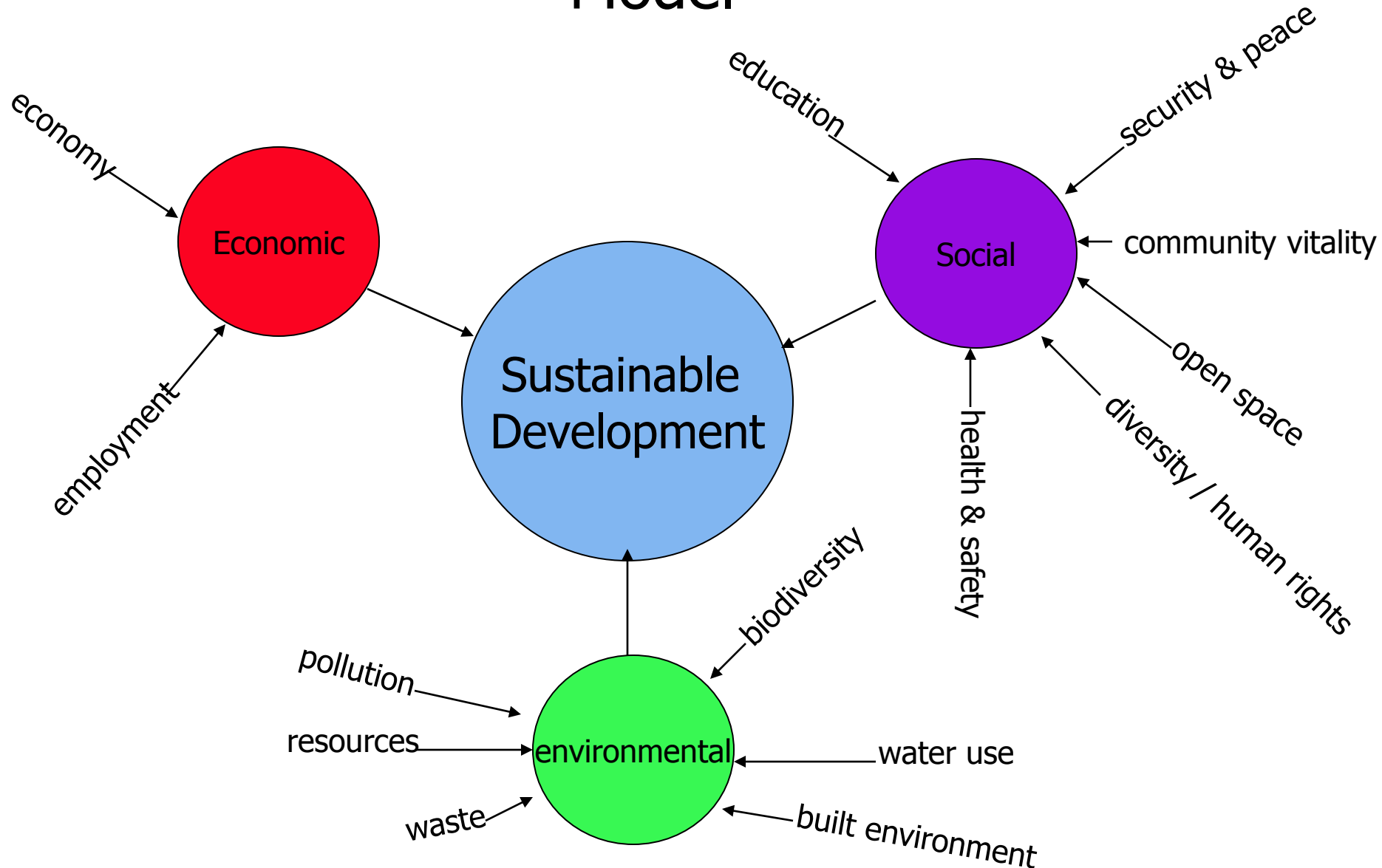
- What does it mean?
 - Using resources effectively and efficiently
 - That is, doing the right thing and....
 - Doing the right thing right!

What's driving this need?

Designing Waste out of Construction

- The term sustainability derives for most people from the Brundtland Report (1987), which implies...
 - Sustainability is about not compromising our future generation's resource needs.
 - It's about living within our means
 - It's about caring about our environment
 - It's about not being wasteful
 - It's about many things

Construction's Sustainable Development Model



Construction Waste UK: some facts



- The construction industry accounts for some 30% of all UK controlled waste arising each year (recent figures suggest over 100 million tonnes)
- 13 million tonnes of construction's waste consists of products and materials delivered to site but not used
- EU produces some 2 billion tonnes of waste each year (aprox. 500 million tonnes from the UK)

Designing Waste out of Construction

- Effective and efficient management of resource use then is needed
 - How?
 - Minimise waste
 - Eliminate waste!!
 - Why?
 - Avoids environmental harm



Designing Waste out of Construction

Key drivers to eliminate /
reduce waste

- Landfill Directive
- Hazardous Waste Regulations
- Landfill tax
- Aggregates levy
- Fly tipping
- Code for sustainable homes
- Site waste management plans
- Duty of care (EPA 1990)

envirowise

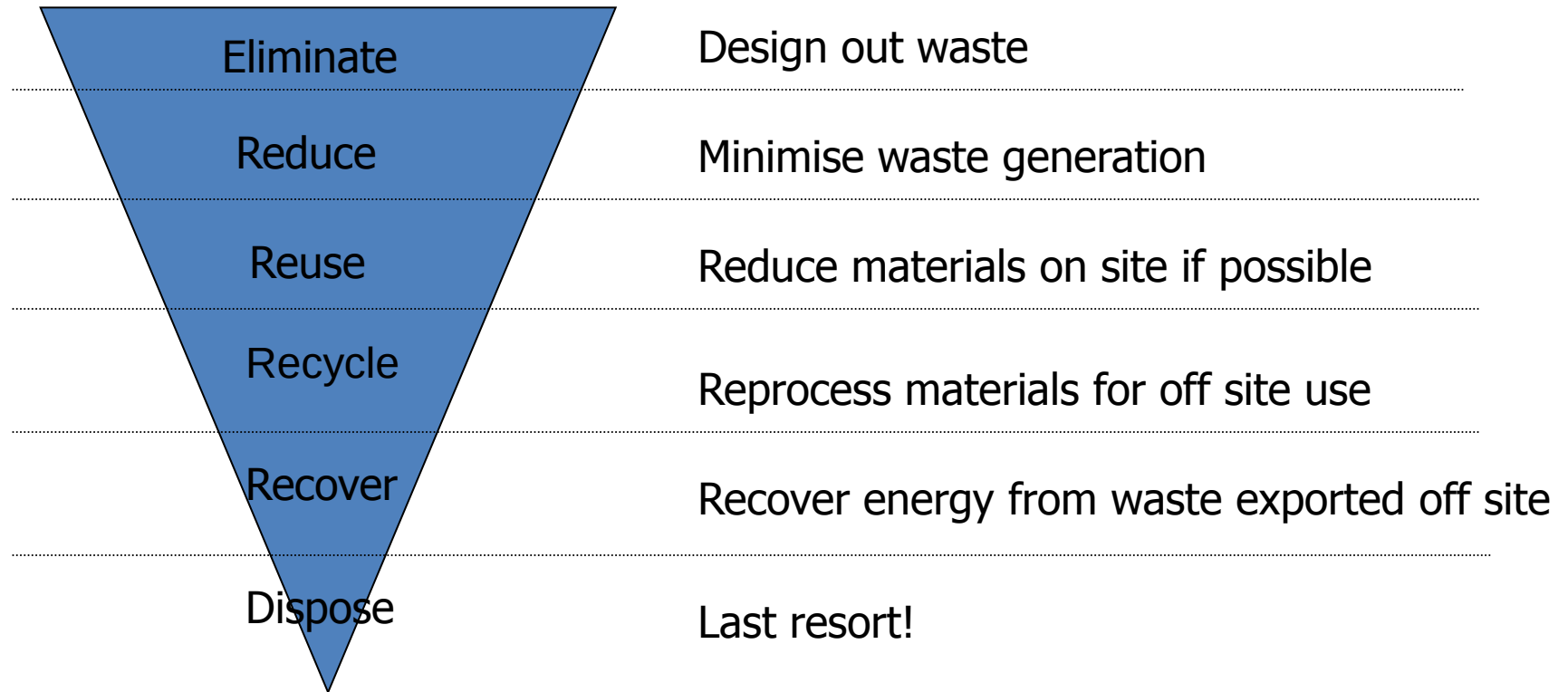


WAG 2006

Eliminating waste makes sense

- Waste costs money!
 - Original purchase price of the material
 - Costs attributed to unloading, handling, storage and movement of the material around site
 - Costs relating to collecting waste or damaged material, reloading, moving and storing waste on site
 - Transportation costs arising from movement of waste off site – tipping costs, landfill charges
 - Costs of replacing damaged and wasted materials

The Waste Hierarchy



Designing Waste out of Construction

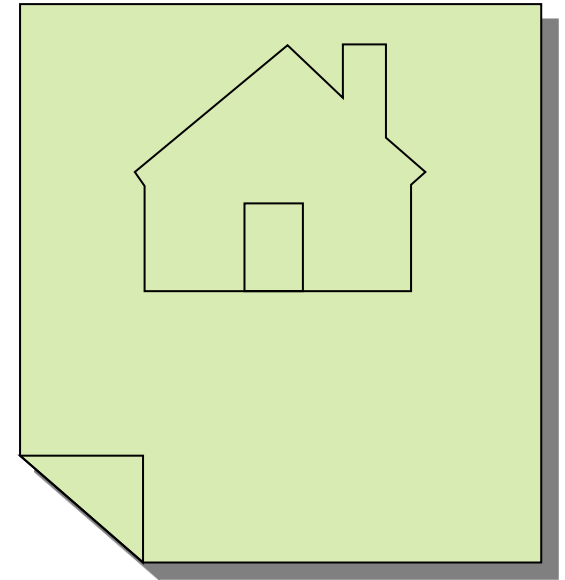
- As much as 50% of waste going to landfill can be from C&D (UK)
- Local projects can fill a local landfill
- Landfill tax helps to force a change in the way we think about waste



Source: BBC

Designing Waste out of Construction

- Technological challenges:
 - Integrated team approach
 - Careful selection of materials
 - Workable supply chain
 - Coordination of components
 - Effective programming
 - Design for deconstruction



Technological Challenges to Efficient and Effective Design

- Design side
 - Legislation
 - Human barriers
 - Additional design costs
 - Procurement / contractual



Technological Challenges to Efficient and Effective Design

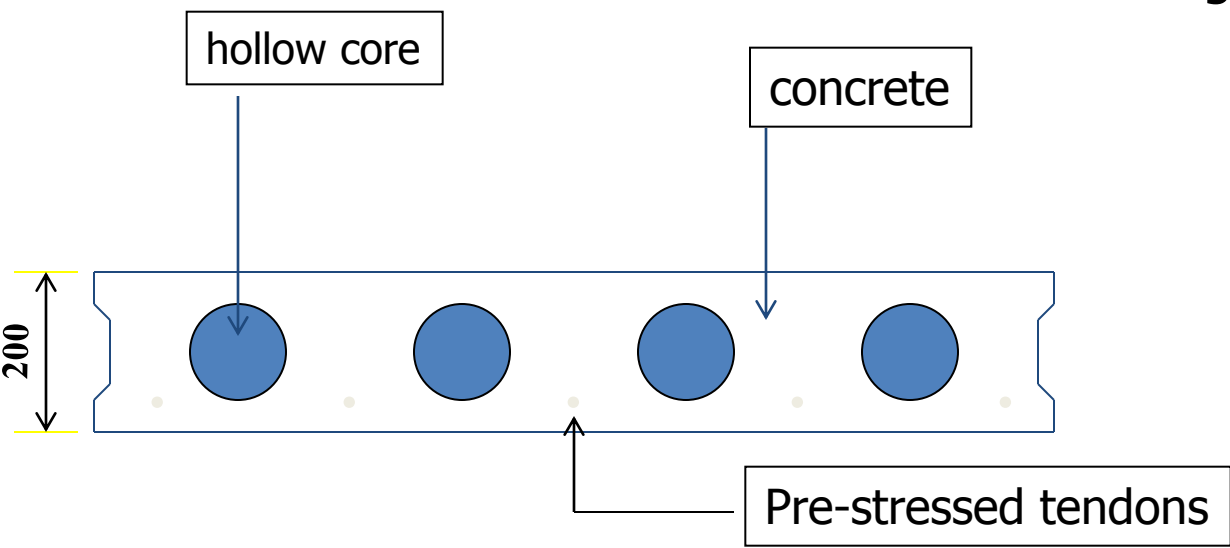
- Pre-construction stage
 - Contractor's input into the design!
 - Tendering
 - » Preparation of tender
 - » Contract documentation:
 - drawings
 - quantities
 - specifications

Case study: the BedZED project

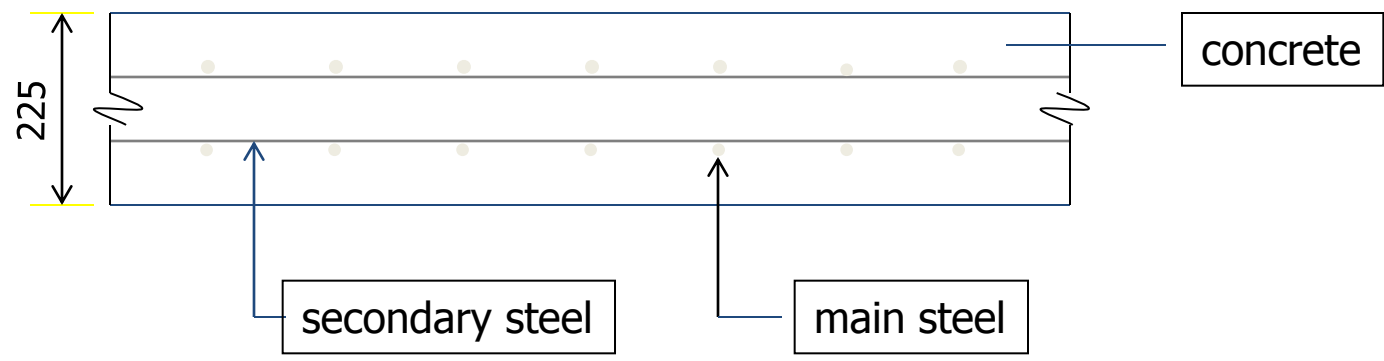
Savings (based on 8000m²)

Concrete 1960 tonnes
Steel 72 tonnes

Potential waste savings
of 39 tonnes concrete
& 1.4 tonnes steel



Pre-stressed Hollow Core Floor Slab



In-situ Reinforced Concrete Floor Slab

Technological Challenges to Efficient and Effective Design

- Measuring up

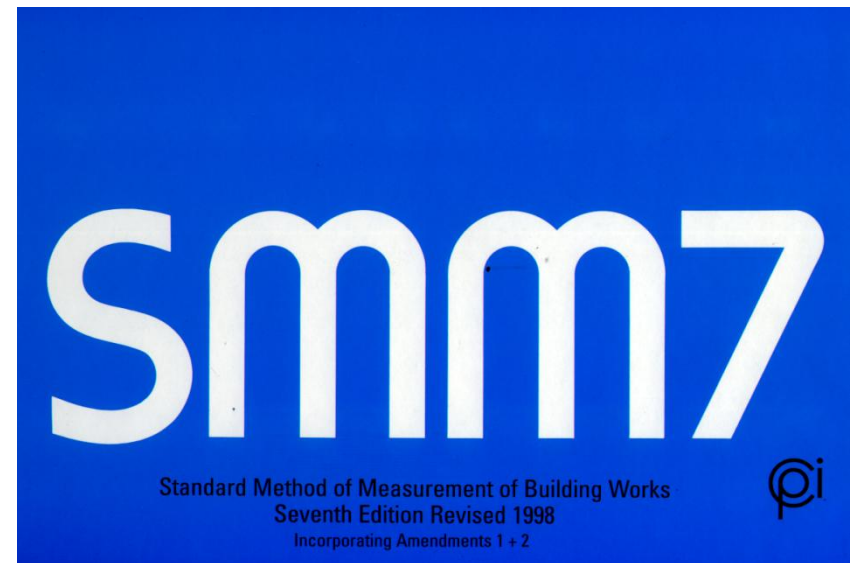
- How?

- Are take-off methods used?

- Standard Method of Measurement!

- How much is allowed for wastage?

- Can all technology be accurately estimated?



Technological Challenges to Efficient and Effective Design

- Specifications!
 - Are they used, can they be achieved?
 - What standards / performances are being asked for?
 - KPIs
 - EPIs

Technological Challenges to Efficient and Effective Design

- The site
 - Is there a site investigation report?
 - Has the site been visited?
 - Obstructions
 - Alien species
 - Ingress and egress!
 - Storage
 - Accommodation
 - Services
 - Wildlife
 - Existing buildings
 - EIA



Technological Challenges to Efficient and Effective Design

- Technical side
 - Recycling
 - Performance
 - Guarantees
 - Robustness
 - Composite construction



Technological Challenges to Efficient and Effective Design

Construction stage

- Procurement policy
 - Buy what you need, not what you think you need
 - Supply chain – is it manageable?
- Construction programme – is there one?
 - Durations – are they achievable?
 - What resources are needed?
 - Unforeseen circumstances
 - Suppliers – deliveries that match programme

Design with intelligence in mind! The move towards waste-neutral construction



Let's design buildings that are able to respond continuously to the needs of their environments, and their occupants in a cost-effective way.

Efficient Design

A way forward!

- Renewable resources
- Less waste
- Cleaner technologies
- Design with nature in mind
- Efficient use of resources



Efficient Design



The drive towards more ecological reasoning

- Ecological economics
- Building ecology
- Bioclimatic design
- Sustainable growth
- Natural capital
- Performance efficiency
- Eco-profiling of materials

Source: Healthy Home Project, Surfers Paradise, Queensland

Look at the work by David Pearce

Efficient Design

Resource Efficiency: the challenges...

- Land
- Food
- Water
- Energy
- Raw materials



Productive land

Supply and demand

Water scarcity

Emissions

Consumption

Efficient Design

- Can construction apply ecological ways of building?



Denby Dale Passivhaus

- Key principles...
 - Consume resources no faster than nature can replenish them
 - Create systems that consume maximum energy-quality
 - Create only by-products that are nutrients or raw materials for resource production
 - Enhance biological and functional adaptability and diversity

Efficient Design

PassivHaus technology typically includes:

- very good levels of insulation with minimal thermal bridges
- well thought out utilisation of solar and internal gains
- excellent level of airtightness
- good indoor air quality, provided by a whole house mechanical ventilation system with highly efficient heat recovery

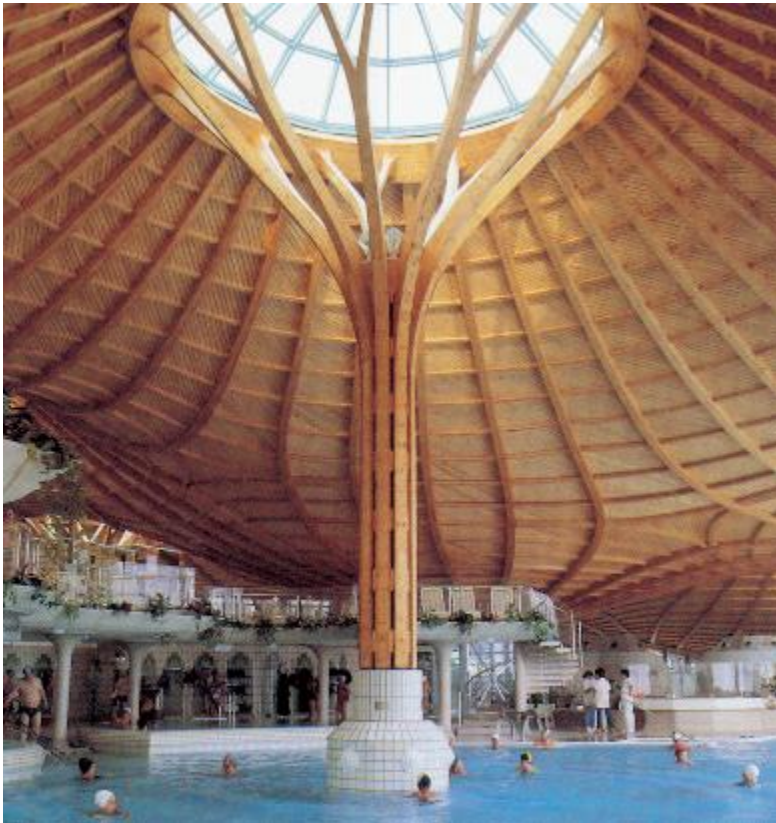


Student halls of residence, Carnegie village, Leeds
Source: passivhaus.org.uk

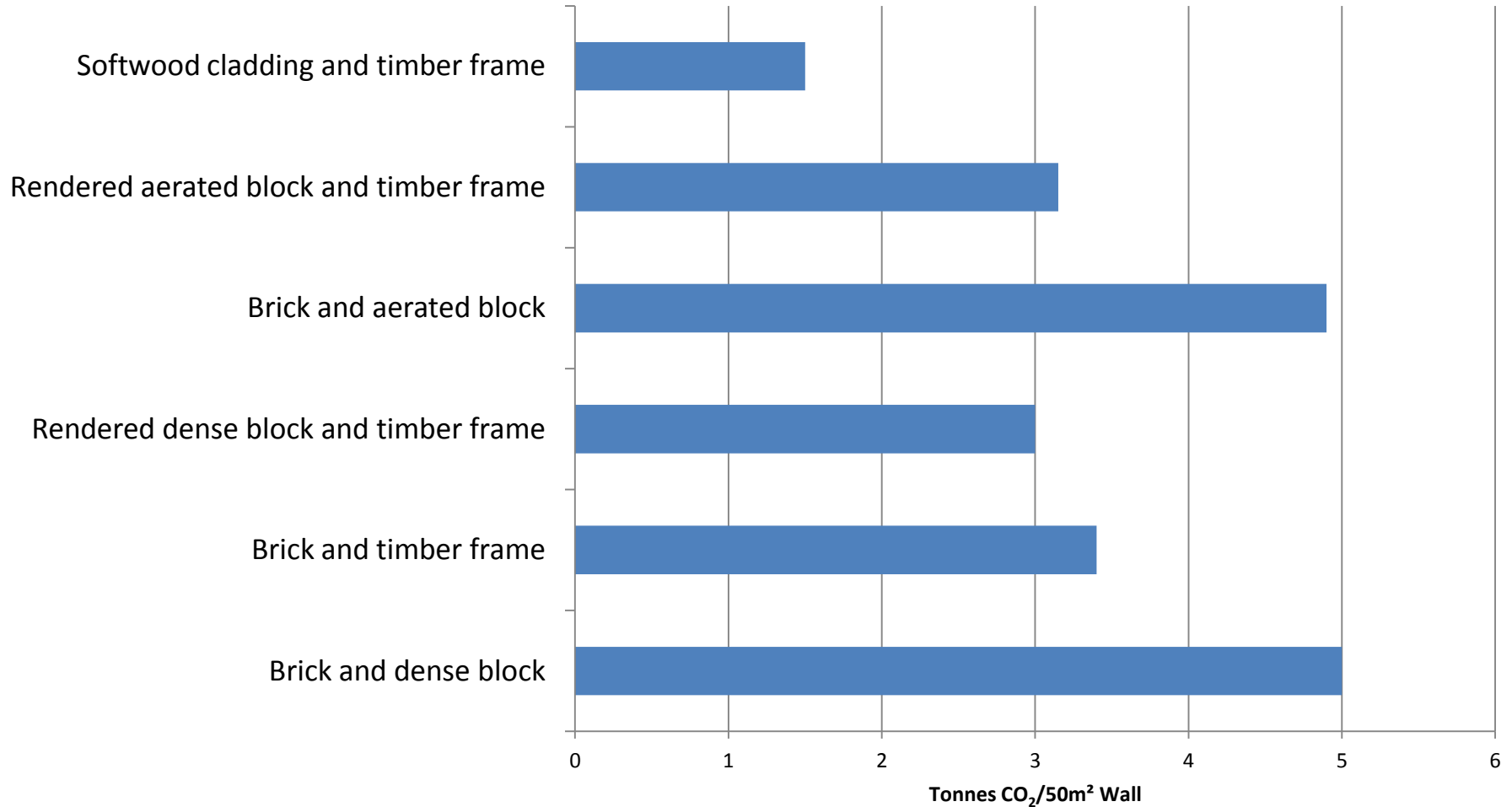
Efficient Design

Materials

- Timber... LCA
 - Production phase
 - Extraction
 - Production
 - transport
 - In-use phase
 - Energy use
 - Thermal properties
 - Maintenance
 - End-of-life phase
 - Recycling
 - Recovery
 - Disposal



Efficient Design



Efficient Design

Much of sustainability relates to the concept of appropriate technology...



‘...the application of technological styles...that respect the natural ecosystems and local social and cultural patterns’.



Efficient Design

- Discussion

Examine the key factors for evaluating the appropriateness of technology for sustainable construction

