

# Achieving sustainable building design

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# Drivers

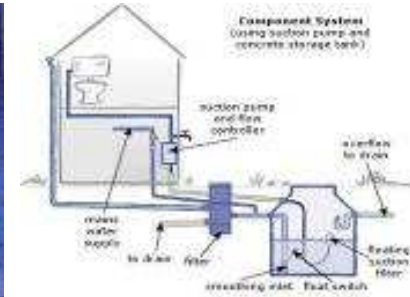
- Environmental problems
- International, national and local policies
- Regulations, planning
- Marketing and public perception
- Long term value?
- Buildings use 40 to 50% of energy

# Sustainable Building Design Features

- Water use
- Energy use / energy efficient design
- Energy supply and renewable energy
- Materials environmental impacts
- Construction and site environmental impacts
- Health and comfort of occupants
- Land use and ecology
- Long term design, flexibility and durability

# Sustainable Building Design Features

## Water Management



- Efficient water fittings and fixtures
- Rain water harvesting and/or greywater recycling
- Leak detection, water metering
- Green roofs, Sustainable Drainage Systems (SDU's)
- Sources of water: desalination, aquifers

# Sustainable Building Design Features

## Green Materials



- Reusable and recyclable materials – responsible sourcing of materials
- Sustainable timber
- Embodied energy
- Minimal toxicity, Ozone and Global Warming Potential

# Sustainable Building Design Features

## Transport



- Good access to and from public transport
- Transport CO<sub>2</sub>
- Cyclist Facilities
- Pedestrian and cyclist safety
- Green Transport Plan

# Sustainable Building Design Features

## Waste Management



- Separation, storage and recycling of waste
- Waste minimisation
- Recycling policies
- Construction waste – off-site
- Waste treatment, energy from waste

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# Sustainable Building Design Features

## Pollution



- Global Warming Potential
- Emissions from energy (NO<sub>x</sub> and others)
- CFC in insulation and refrigerants
- Pollution during construction (watercourse, ground, air, noise)
- Night-time pollution
- Noise

# Sustainable Building Design Features

## Health, Comfort



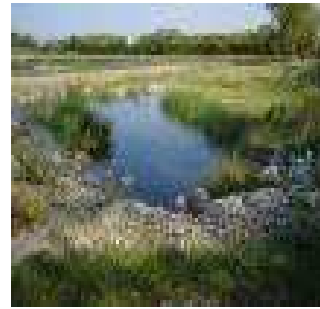
- Thermal comfort
- Internal pollution
- Noise
- Visual comfort: Lighting levels, views out, glare control
- Local Control

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# Sustainable Building Design Features

## Ecology



- Construction Density
- Mitigating ecological impact
- Ecological enhancement
- Greenfield / Brownfield

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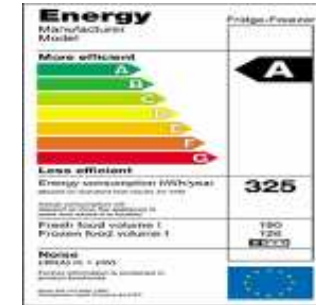
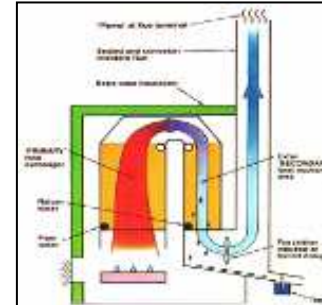
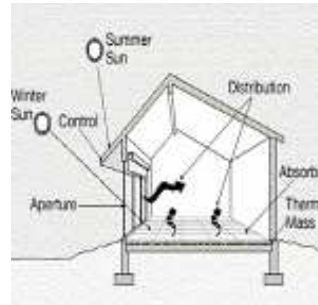
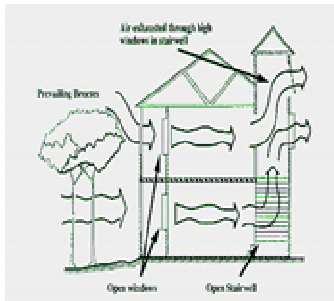
# Sustainable Building Design Features

## Future Proofing

- Flexibility for future use
- Global warming?
- Durability

# Sustainable Building Design Features

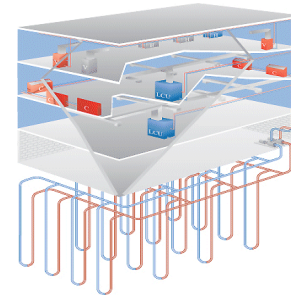
## Energy Efficiency



- Climate responsive architecture (passive solar design, ventilation, thermal mass...)
- Low energy lighting
- Energy efficient appliances
- Energy efficient heating and cooling system

# Sustainable Building Design Features

## Low Carbon Energy Supply



- Wind energy
- Solar energy: Solar thermal, Photovoltaic's, Solar air collectors
- Ground source heat pumps, Ground air heating and cooling
- Biomass
- Conventional CHP
- Microhydro

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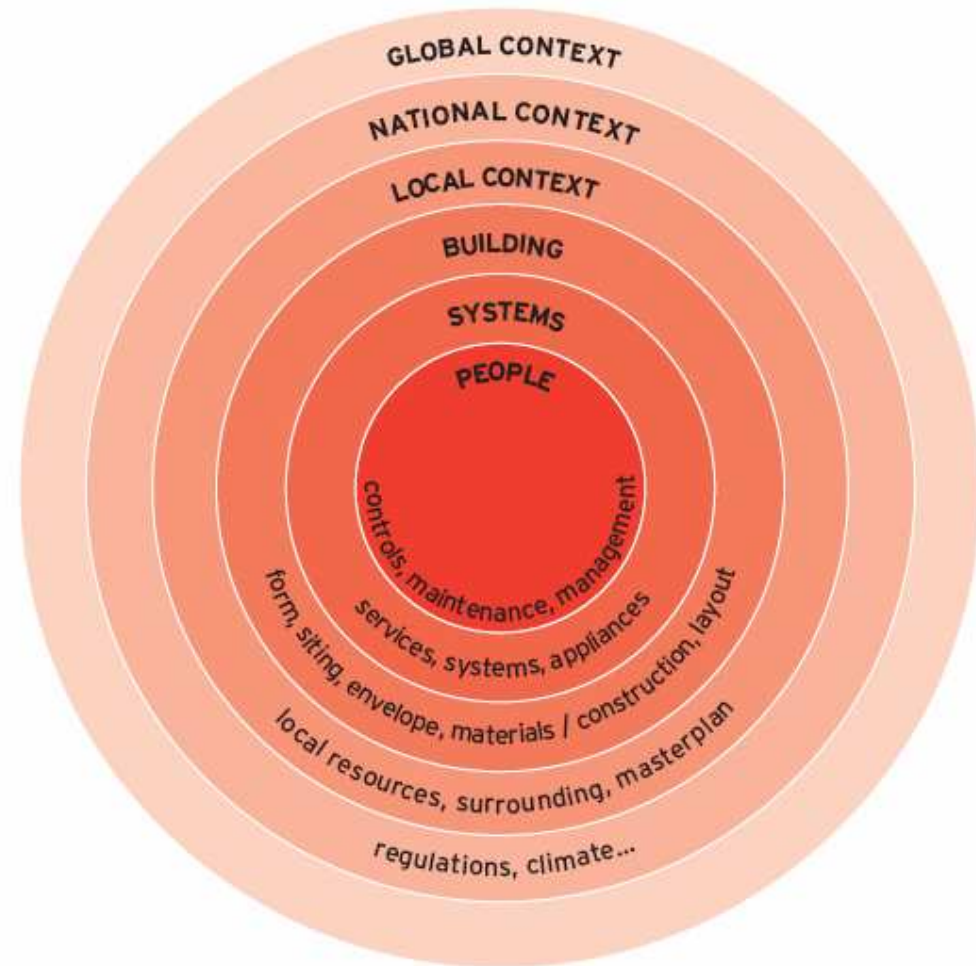
# Tips To Achieve Sustainable Design

## TIP 1: Understand objectives

- Energy efficiency / Costs?
- Marketing value?
- Company Policy?
- Planning/ regulations?

## TIP 2: Contextual and integrated design

- The building must be adapted to its context
- Integrated sustainable design is often cheaper

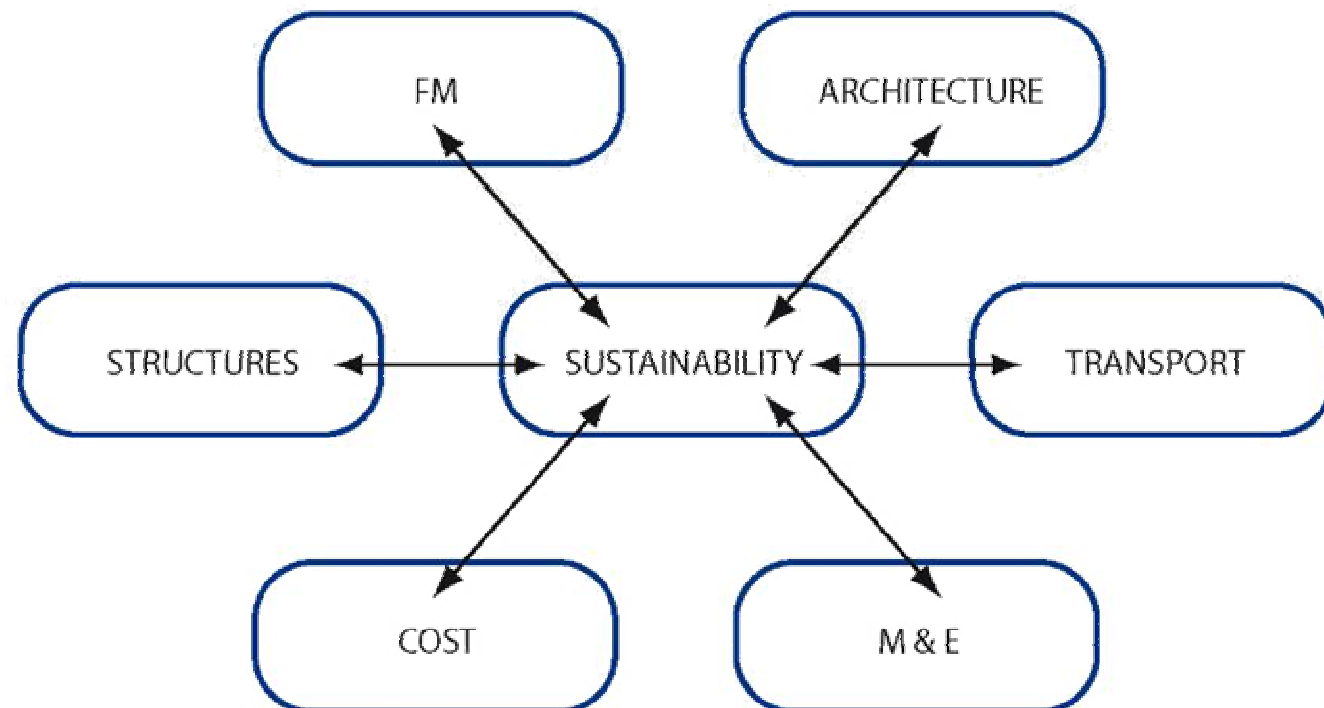


## TIP 3: Consider sustainability early

- To understand cost implications
- To achieve optimum performance
- To achieve integrated design
- For better flexibility whilst the design evolves

## TIP 4: Adopt A Multidisciplinary Approach

- All design disciplines need to take sustainable principles into account
- A sustainability consultant can help balance benefits



## TIP 5: Use KPI's

- Measure sustainability performance
- Can be used as design checklist
- They can help identifying costs
- To establish targets

⇒ Environmental Assessments: BREEAM, LEED

⇒ Other performance indicators: energy/m<sup>2</sup>, water use/m<sup>2</sup>, kgCO<sub>2</sub> /m<sup>2</sup>

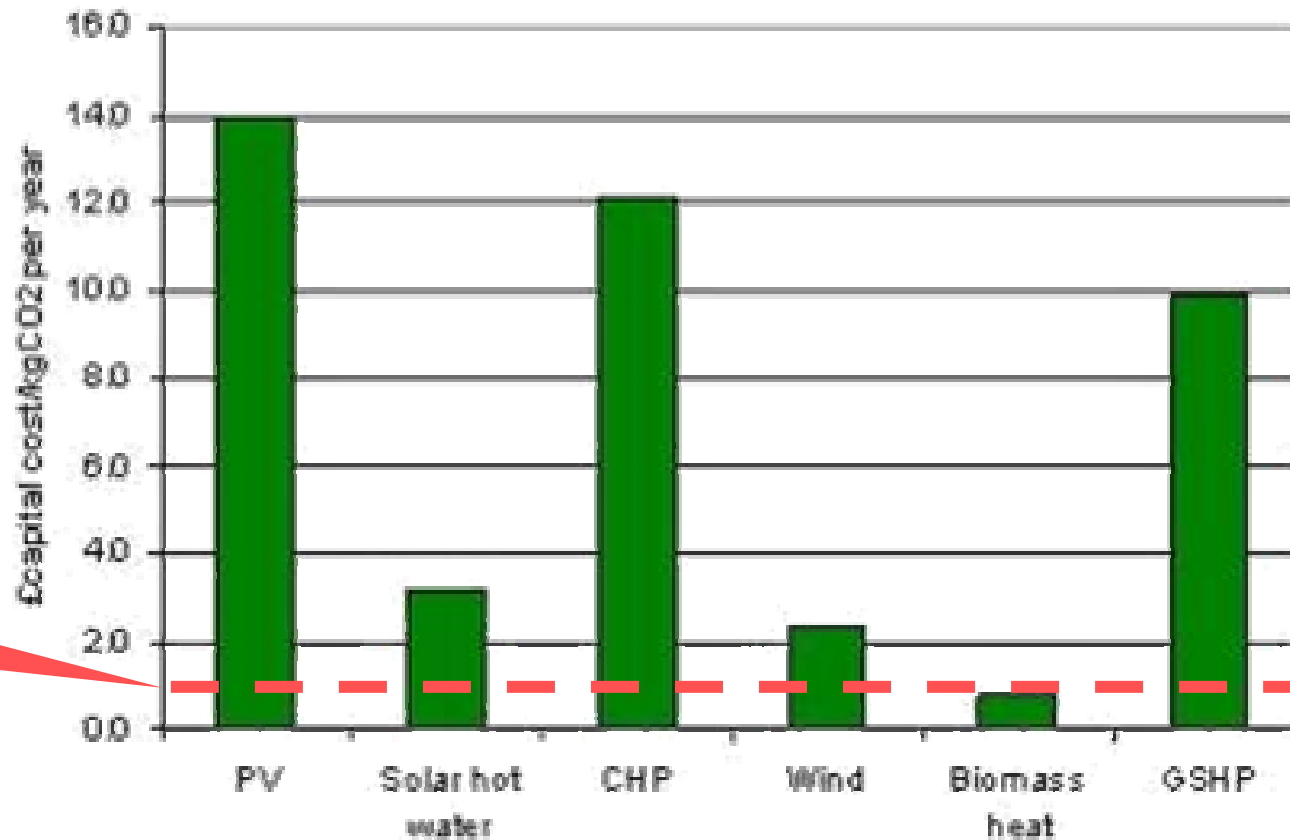


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# TIP 6: Cost benefit analysis

Capital cost of CO2 savings, per year



Insulation

## TIP 7: Monitor performance along design

- Monitor performance against KPIs
- Monitor cost
- At key stages

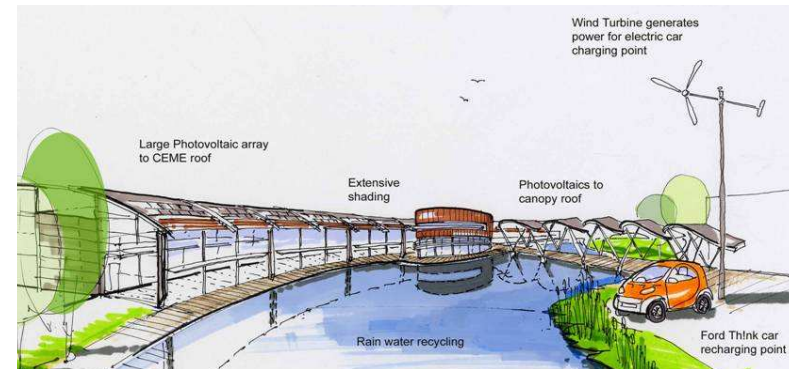
# Sustainability: Tips

- Understand objectives
- Building needs to be considered in its context for an integrated approach
- Sustainability is multidisciplinary
- Sustainable design and costs need to be considered early on
- Use KPI's
- Cost benefit analysis
- Monitor cost and performance against design

# Project Examples

# Centre for Engineering & Manufacturing Excellence, Dagenham

- Centre for training and education part-funded by Ford Motors in Dagenham
  - 115kW PV array on roof
  - Automatic Louvres to street
  - Air displacement system
  - Daylight analysis



# East of Swindon

- 12,000 house development East Swindon Development Group
  - Energy Supply Calculation Tool
  - Cost benefit analysis for different energy and renewable energy systems (CO<sub>2</sub> / Capital cost)
  - Includes SHW, PV, GSHP, Biomass, Waste to Energy, Wind, Fuel Cells, CHP, Biomass CHP



# Belgrave House

- Speculative office of 30,000m<sup>2</sup> of floor space, developed by Grosvenor and Jer Partners in London's West End
  - BREEAM Very Good
  - High efficiency building services systems



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