



# Carbon Hierarchy

Fuel Energy Heat  
Low Carbon Lifestyle

# Low Carbon Lifestyles

- Carbon in isolation?
- Can you ignore other issues?
  - Water
  - Material Resource efficiency v Waste
  - Natural v Chemicals & Health & Safety
- They all have a Carbon load
- So I think not

# Carbon in Fuel, Energy, Heat?

- Fossil Fuels release CO<sub>2</sub> when burned
- Transport: people and goods: fuel
- Heating Lighting Cooling Ventilating
- Power to engines, pumps, etc.
- Communications & IT power to and cooling of computers and servers
- Wasted fuel, energy, heat and coolth

# Carbon in Water?

- Chemicals & Purifying, Pumping, Irrigating, Softening, Heating, Washing, Cleaning, Bathing, Power Showering,
- Wasted water: leaks, excess flow and evaporation
- Bottled water from any distance
  - Food miles

# Carbon in Materials?

- Embodied carbon in materials
- In buildings, purchases, goods,
- Food, water and drink miles
- And in wasted materials
- And don't forget methane from waste in landfill (21 x GWP of CO<sub>2</sub>)

# Carbon Hierarchy: Ambition

Cost  
effective

Effort

Remove  
Reduce  
Reuse  
Recycle  
Recover  
Return  
Reject

# Carbon Hierarchy: Reality

Missed  
Opportunity

Status quo  
Prevails

Remove

Reduce

Reuse

Recycle

Recover

Return

Reject

# Remove Demand: Fuel Energy Heat

- Remove the need to heat and cool, by design:
  - Do keep doors and windows between conservatories and buildings
  - Maximise heat capture and exploit it later
  - Use thermal mass to store heat for later
  - Ventilate top and bottom to enable natural cooling



# **Remove Demand: Wasted Fuel Energy Heat**

- **Do not install heating in conservatories**
- **Do not remove doors and windows  
between building and conservatories**

# Reduce: Fuel Energy Heat

- **Reduce the heat loss**
  - Education, insulation, airtightness, thermal breaks, weather stripping, education
- **Reduce the heat gains**
  - External solar shading of glass
  - External solar shading of walls: green walls
- **Reduce the use of internal solar shading**
  - They capture and re-radiate heat internally

# Reuse: Fuel Energy Heat

- Heat from energy generation in CHP
- Reuse heat gained in conservatories in the buildings
- Reuse the heat gained in the day into the evening

# Reuse: Wasted Fuel Energy Heat

- Hot air from plant rooms
- Heat from compressors
- Heat from transformers
- Heat recovered from mechanical ventilation extraction to heat building or hot water: Air source Heat pumps
- Heat from food refrigeration

# Recover: Fuel Energy Heat

- Energy from waste
- Anaerobic digestion: Methane/Fuel
- Combustion of waste with heat recovery
- Extra care with pollutants
- Very high temperatures are necessary
- Very efficient kit needed

# Return: Fuel Energy Heat

- Return excess to requirement to the grid
- collect from grid when demands are higher

# Reject: Fuel Energy Heat

- **Wasting energy**
  - **Patio Heaters: Dismantle or disable**
- **Excess Heat: Question it**
  - **“Warning: very hot water”: Why?**
- **Leaving lights on: Control it**
- **Squandering lifestyles: Challenge it**
- **Make it your responsibility**