

# **Carbon Footprinting & Logistics + a little something about the HA's approach to Climate Change**

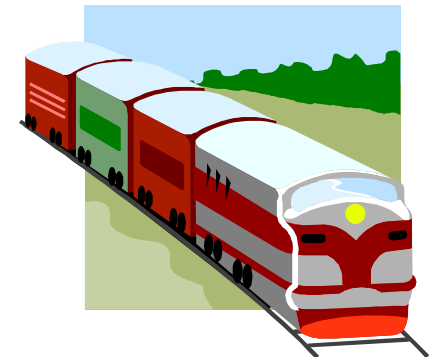
Geoff Richards  
November 2007

- Introduction
- Methods for Estimating CO2 Emissions
- Carbon Footprints of Different Modes of Freight Transport
- Potential Management Actions
- Government Incentives
- Potential Contribution of the Freight Sector to UK CO2 Reduction Target
- Cost-effectiveness of CO2 Mitigation Measures in the Freight Sector
- Public Policy Levers on Key Freight Transport Variables
- HA approach to Sustainable Development & Climate Change



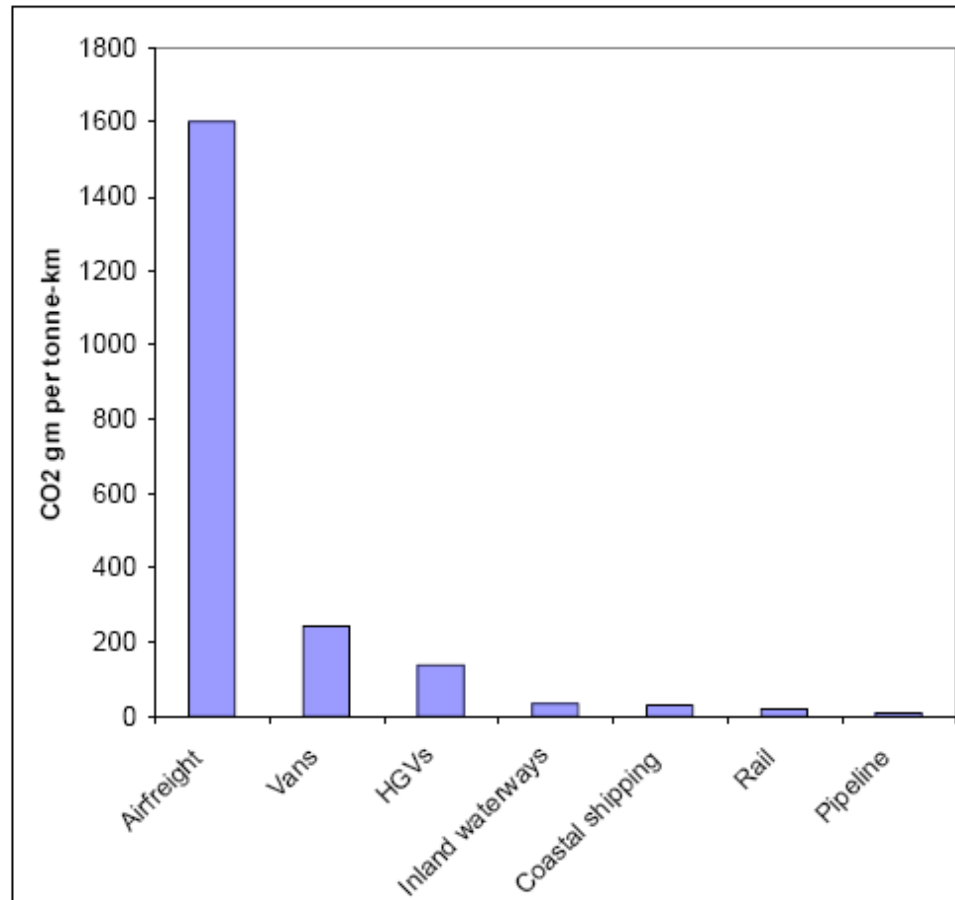
## Freight Transport:

- 21% of all CO<sub>2</sub> emissions from the transport sector
- 6% of total CO<sub>2</sub> emissions in the UK

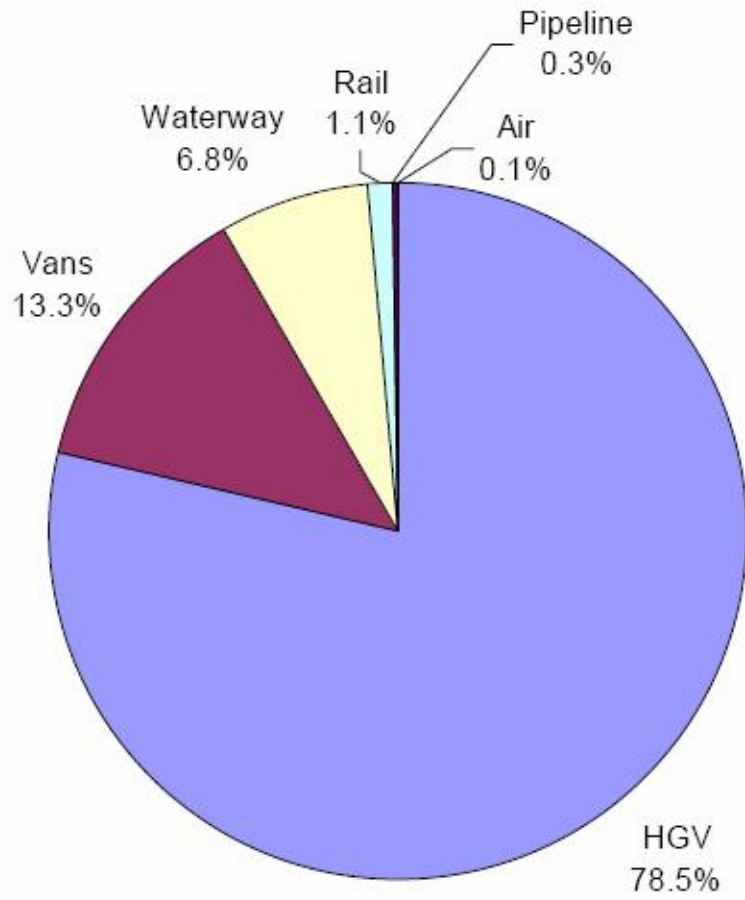


- **Input-based measures** - based on estimates of the fuel purchased by / supplied to companies in particular sectors
  - UK registered companies
  - Difficult to determine UK only CO2
- **Output-based measures** - derived from estimates of the amount of freight movement, expressed either in tonne-kms or vehicle-kms
  - Not confined to just UK businesses = total CO2 for all trucks in UK
- Most modes both available – aviation only output, do not differentiate between passengers and freight

# Average CO2 Intensity Values for Freight Transport Modes

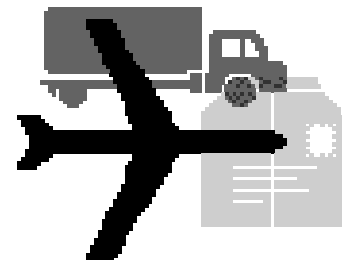


# Modal Shares of CO2 Emissions from Domestic Freight Transport (2004)



## 1. Reduced handling factor:

- – reduce the nodes and links – intermediate locations for processing, storage + handling
  - Some nodes act as consolidation points
  - Where links in start and finish are aligned little to be saved
  - Most freight data for individual journeys – not supply chains + their geography



## 2. Reduced length of haul:

- *reconfiguring production and distribution systems* – need financial incentive – emissions trading + caps?
- *sourcing products from local suppliers* – would need increase in travel costs
- *finding shorter routes between collection & delivery points* – computerised vehicle routing + scheduling reduce travel by 5-10%, but not always reduce CO2 – current time/money basis

### 3. Modal split:

- **Rail freight**

- Tonne km' grew 24% 1998 to 2004
- 60% Coal and coke – needs to diversify

- **Waterborne**

- 75% crude petroleum + products
- Water Freight grants (since 2001)
  - 2001 to 2005 £28.3 million – removed 1.4 Billion lorry miles



4. **Vehicle utilisation**: logistics often constrained by targets of other dept's

- **Inter-functional**

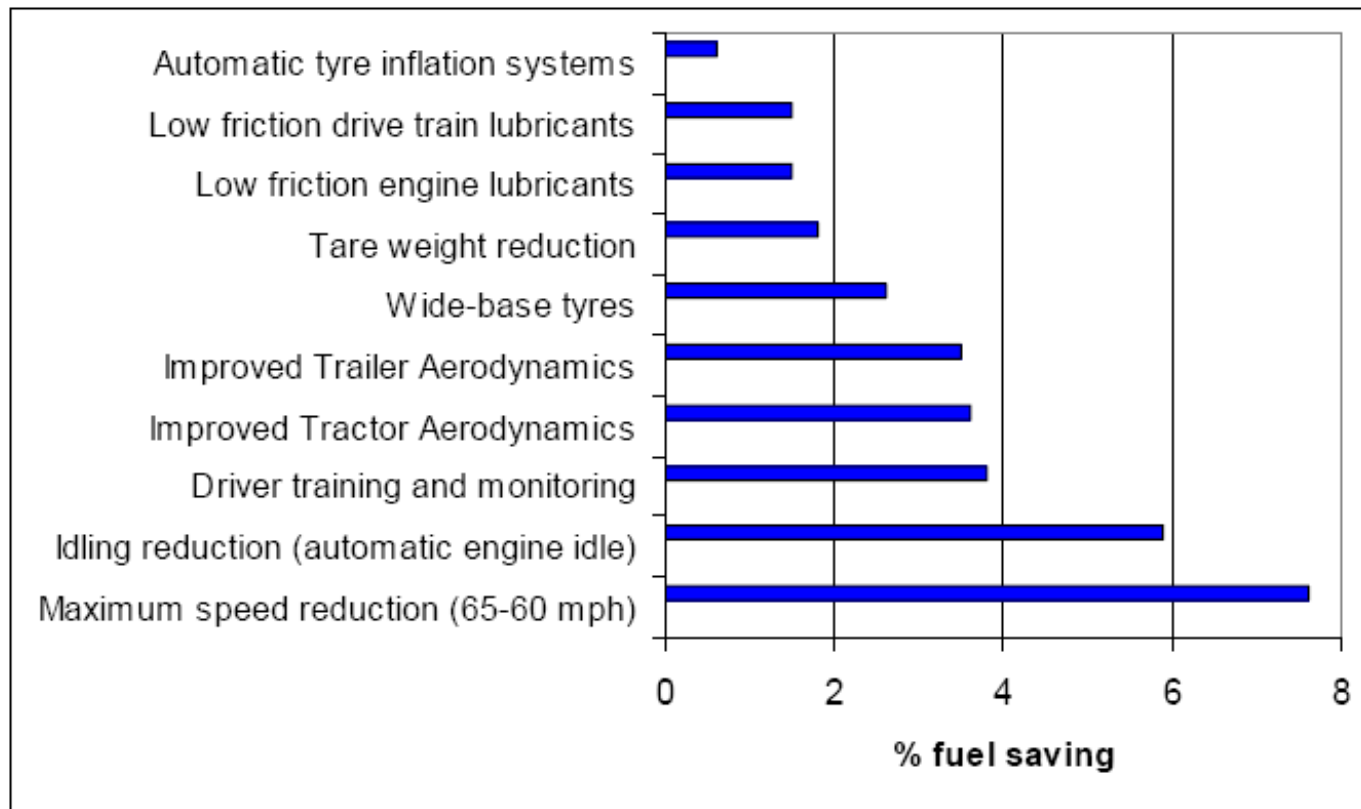
- Transport, production, procurement, inventory management, warehousing, sales

- **Consolidation of Loads in Heavier and / or Larger Vehicles** – 2 deck vehicles can cut CO2 emissions by 49% compared to 2 single vehicles

- **Adoption of More Transport-efficient Order Cycles** – nominated day delivery -

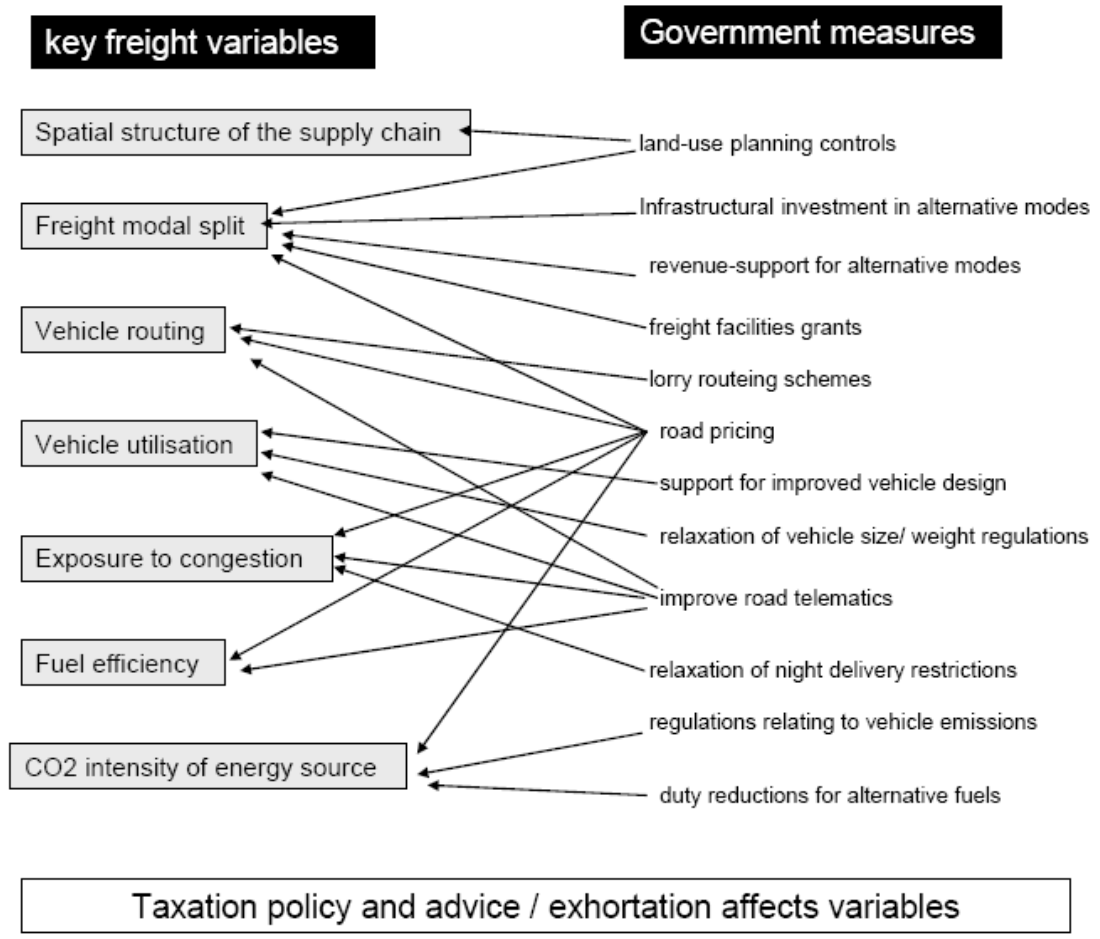
- **Inter-company Collaboration**

## 5. Energy efficiency:



**Figure 11: Estimated Fuel Savings from Fuel Economy Measures: US Trucking**  
(source: Ang and Schroeer, 2003)

# Public Policy Levers on Key Freight Transport Variables



## Cost-effectiveness of CO2 Mitigation Measures in the Freight Sector

Measure	Appraisal period (years)	£ / tonne of carbon saved
Driver training in fuel efficient driving (over 5 years)	5	65-75
Financial incentive for modal shift to rail (over 3 years)	3	90
Streamlining of HGVs (over 5 years)	5	130
Company advice on HGV fuel efficiency (over 5 years)	5	190
Company advice on vehicle routing and telematics	5	240

### Estimates of the Cost-effectiveness of Several Carbon Abatement Measures

Can be assessed in three ways:

- Direct cost to companies of implementing the measures
- Indirect costs associated with any losses in economic efficiency and sales
- Net cost to government of fiscal changes, infrastructural investment

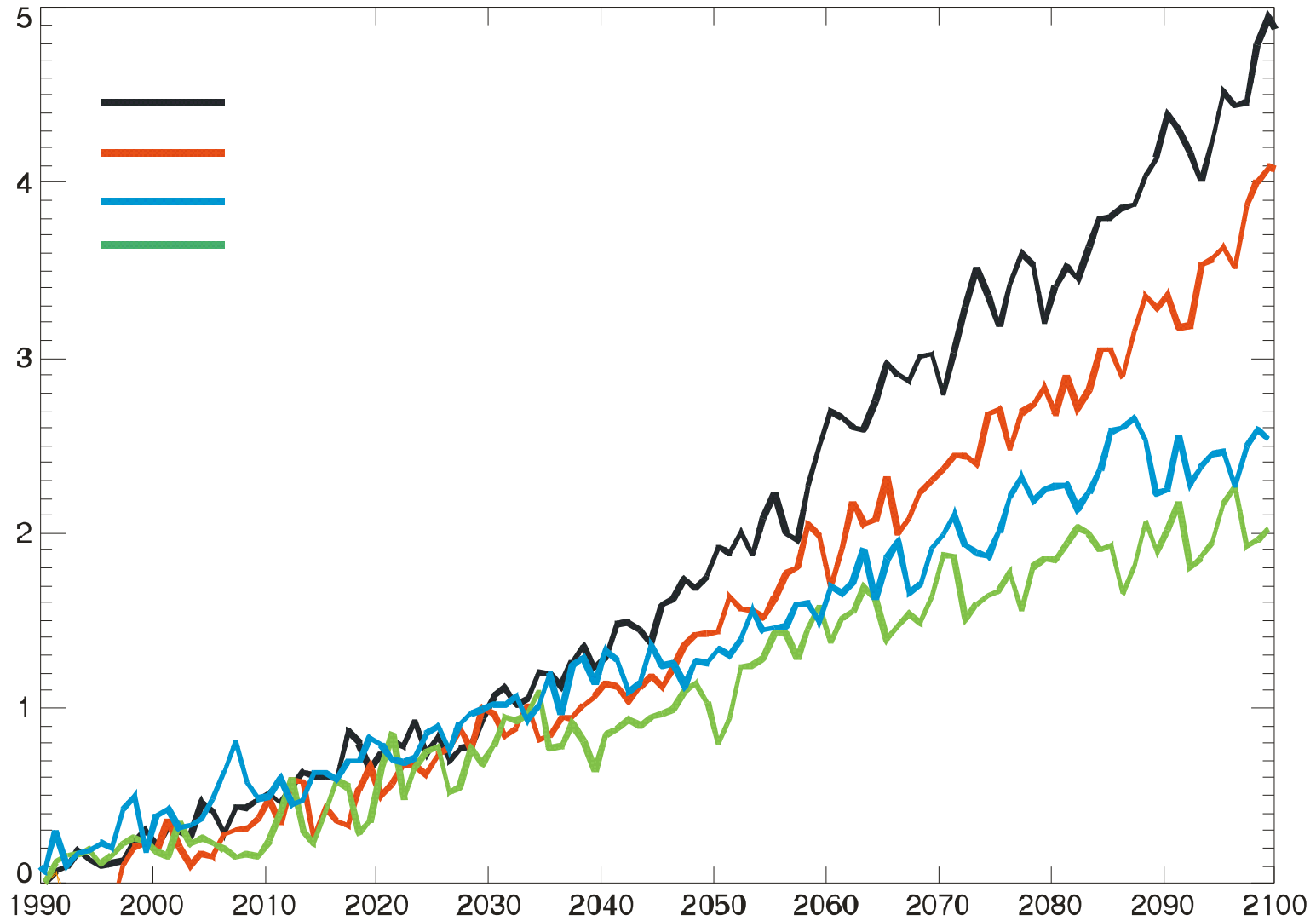
- 21% of all CO<sub>2</sub> emissions from the transport sector
- 92.8% of Emissions from Domestic Freight Transport – Road transport
- **Methods for Estimating CO<sub>2</sub> Emissions:**
  - Input-based measures
  - Output-based measures
- **Potential Management Actions**
- Public Policy Levers on Key Freight Transport Variables
- **Potential Contribution of the Freight Sector to UK CO<sub>2</sub> Reduction Target – up to 13 tonnes CO<sub>2</sub>**
- Cost-effectiveness of CO<sub>2</sub> Mitigation Measures in the Freight Sector

# Climate Change and the HA



- A Risk management issue
- Adaptation
- Mitigation

# Global Temperature Models



- Global CO<sub>2</sub> emissions: 6.4GtC (1990s), 7.2 GtC (2000s)
- Predicted warming in C21: 1.0°C to 6.3°C
- Oceans warmed since 1950s; now rising at 3mm/yr
- Next 30 years = 0.7°C warming anyway.

## Predicted changes to UK extremes by the 2080s



- x10 to x20 increase in hot summer days
- x10 to x20 increase in warm summer nights
- “Record” hot temperatures predicted to be 8°C hotter
- 50% reduction in frosts
- 3 x the number of winter heavy rainfall days

# Adaptation to climate change



- We base our work on the historical evidence of the weather
- Past is no longer the key to the future
- Future predictions needed to set parameters for design, maintenance & management

# Temperature

BS EN 1991-1-5 typical effective bridge temperature	<b>Steel Bridges</b>	<b>Steel/ concrete composite</b>	<b>Concrete Bridges</b>
<b>Maximum Effective Temperature</b>	<b>51.5 °</b>	<b>39 °</b>	<b>36 °</b>

BS EN 1991-1-5 typical effective bridge temperature + 10degC	<b>Steel Bridges</b>	<b>Steel/ concrete composite</b>	<b>Concrete Bridges</b>
<b>Maximum Effective Temperature</b>	<b>60 °</b>	<b>48 °</b>	<b>46 °</b>

# Precipitation

- **2080': return period of one year**
  - increase in precipitation up to 10%
- **2080': return periods of 5 and 30 years**
  - increase in daily precipitation by up to 40%



# Risk Management

- Review monitoring and maintenance regimes
- Review of design standards, specifications
- Improve infrastructure resilience
- Consider need for major upgrades or re-routing
- Avoid new development in at risk locations

- Inform traveling public and have contingency plans in place



# How will Climate Change affect our customers?

## Is this the Future?



**1** Barricades that should have been used to defend Upton-on-Severn were stored in Bistoil. The material was loaded on to a lorry and dispatched but got caught in a 40-mile gridlock on the M5.

**2** More than 750 people stranded in cars, caravans, houses and boats were rescued in Worcestershire.

**3** In Pershore 86.8mm of rain fell in 8 hours according to the Met Office.

**4** Tewkesbury's Mythe Water Pumping station became inoperable after being deluged by flood waters on Sunday, leaving 150,000 homes without water.

**5** The Castlemeads power station in Gloucester was repaired by emergency services on Tuesday, restoring power to more than 48,000 homes. Walkham power station was protected, with water reaching within 25m of flooding the station forcing the power to be cut off from 250,000 people.

**6** Thousands of motorists on the M5 were stranded for up to 10 hours in a 40-mile jam on Friday night and Saturday morning.

**7** In Brize Norton 101mm of rain fell in 7 hours, a 1:600 year event.

**8** The roads out to Chipping Norton and Witney were impassable, and in Charlbury flood waters badly damaged the bridge into town.

**9** In Oxfordshire river levels appeared to have stabilise after 3,000 homes were flooded. Three flood warnings are still in place for stretches of the Thames and the River Ock.

**10** Residents in Buckingham were warned to avoid water contaminated with chemicals and sewage after the River Great Ouse burst its banks on Saturday.

or this?

- ***“Water airlifted to parched M25 drivers”*** Daily Telegraph June 2006



- Development of a climate change adaptation strategy
  - Provision of guidance on future UK climate parameters
  - Develop a risk assessment methodology that can be applied across the HA business

# Climate Change adaptation and mitigation are part of the wider Sustainable Development agenda

We contribute to causes of climate change

- Developing carbon accounting framework

- Know your network
  - Record data on weather impacts
  - Anecdotal information matters
- Don't make climate change special
  - Include as part of maintenance strategy
- Climate change is a risk management issue
  - Know your present vulnerability
  - Understand how this will change over time

Climate change mitigation and adaptation is part of the sustainable development challenge



The gifts we give our children.