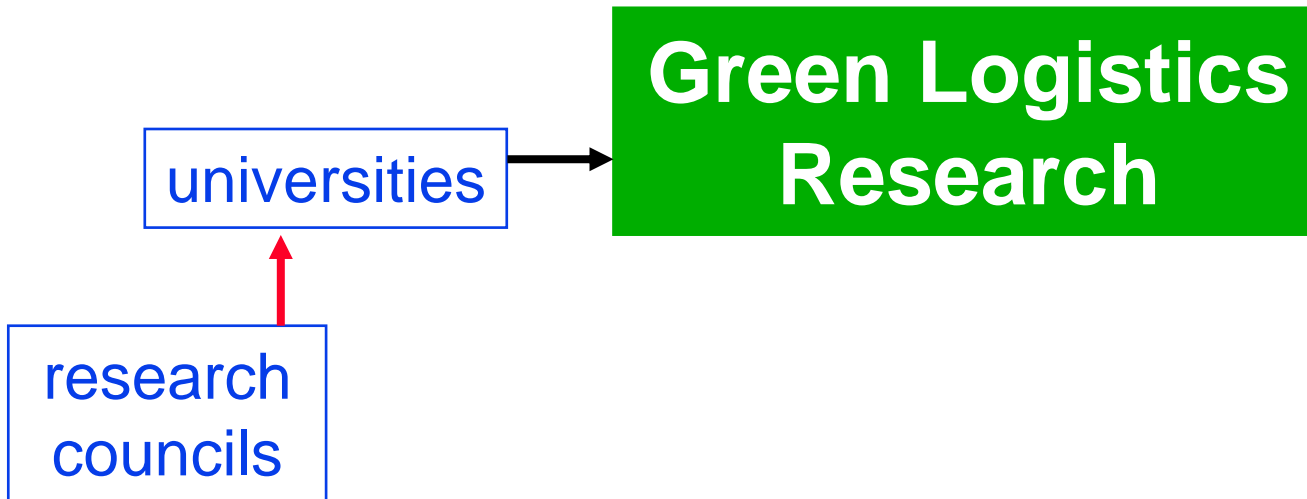

A Short History of Green Logistics Research in the UK

Professor Alan McKinnon
Logistics Research Centre
Heriot-Watt University

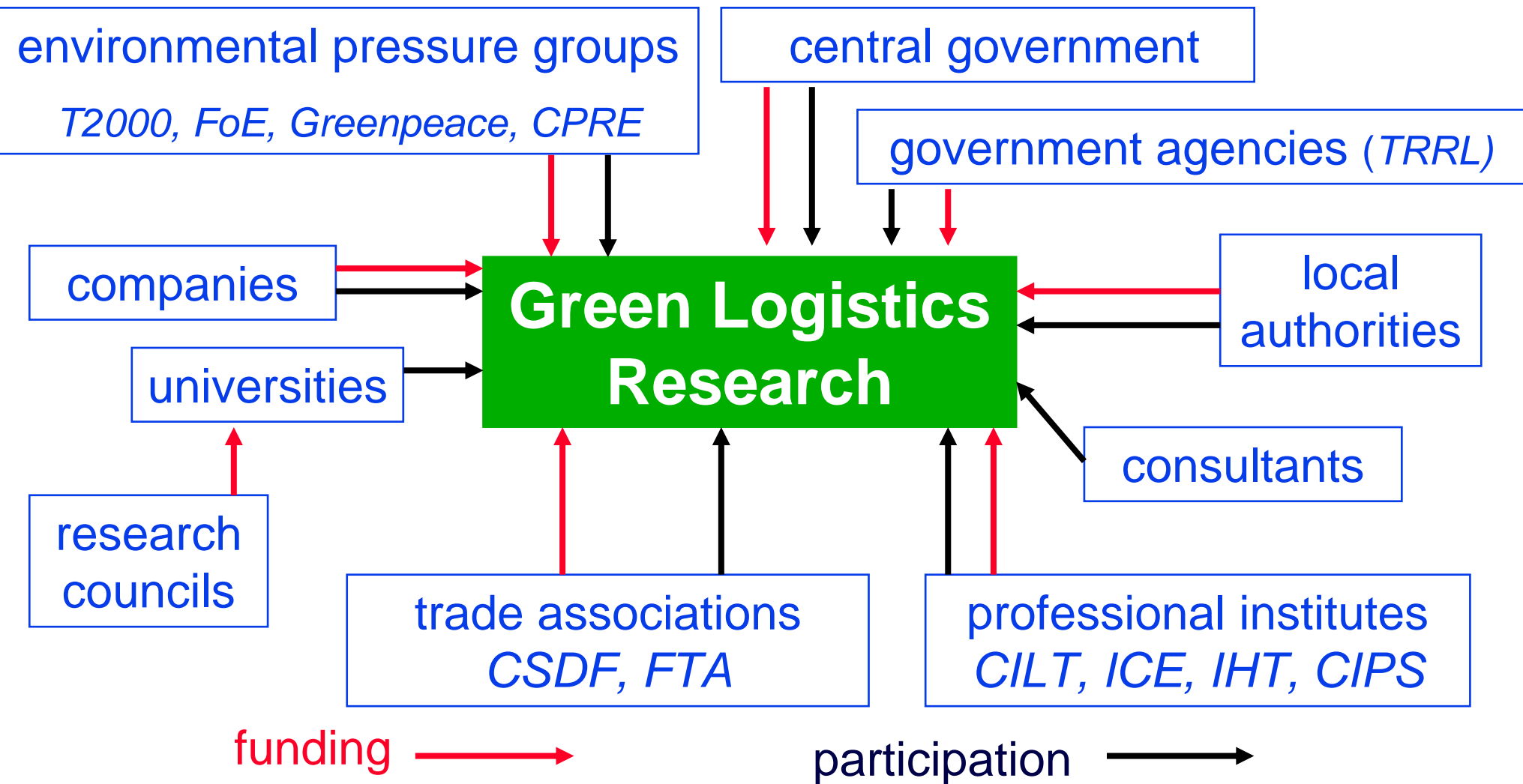


- Most logistics research focuses on ways of saving money / increasing profitability
- Many efficiency improvements also yield environmental benefits
- Review confined to research which is explicitly concerned with the environmental impact of logistical activity

Research Sponsors and Participants



Research Sponsors and Participants



- Reducing the environmental impact of freight transport
- Managing the return flow of waste – reverse logistics
- Minimising the effects of warehousing on surrounding areas

1970s

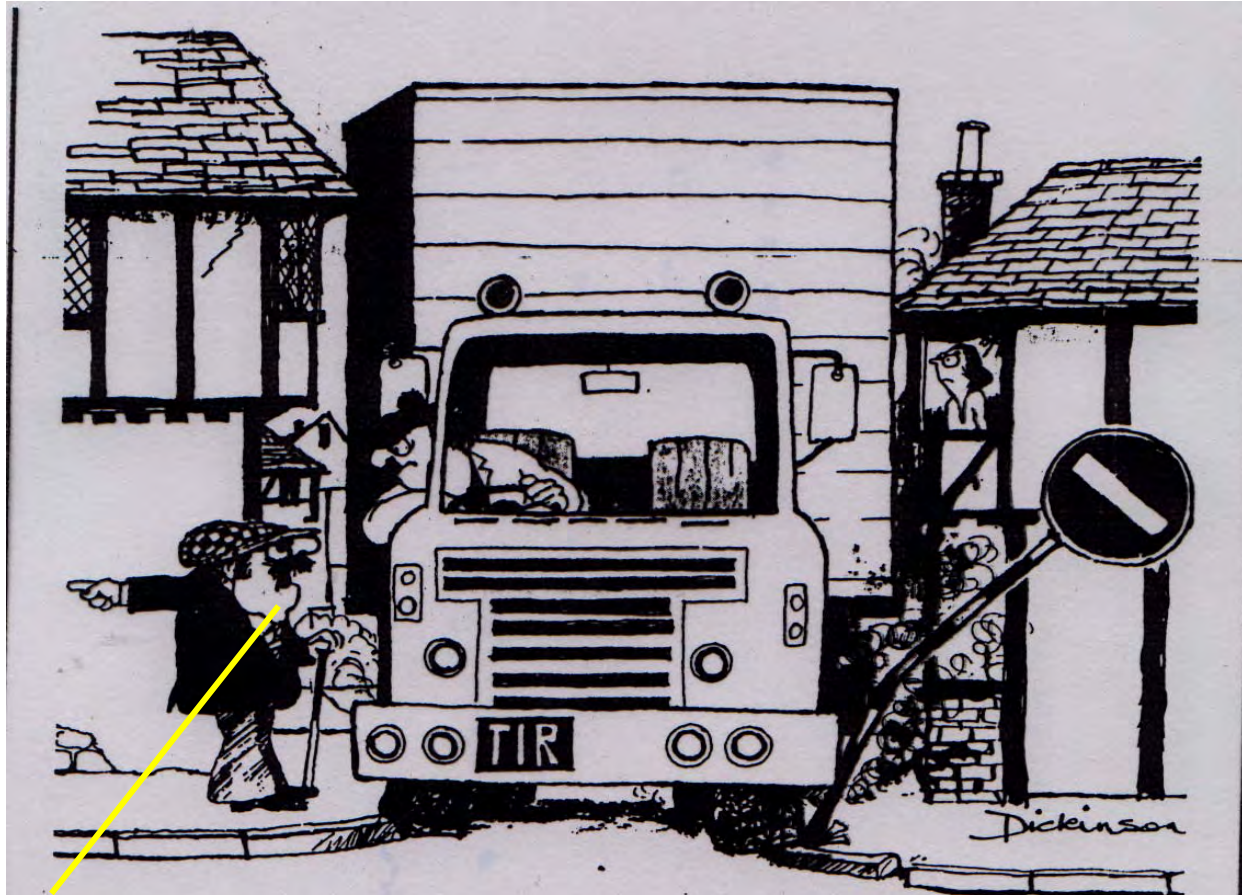
Origins of physical
distribution / logistics
as an academic
discipline

Emergence of
environmental campaigning
against heavy lorry traffic
and road construction

concern mainly about localised impact of freight traffic

Cooling trend since 1945 causing
concern about return of the Ice Age

Intrusion of the heavy lorry.....



Punch 1973

'Smash the next lamp on the left, flatten the pavement by the pub, nudge the sweet shop, scrape the Market Cross, then just follow the skid marks to London'

Growth of Anti-Lorry Sentiment

Reasons:

- Sharp increase in lorry traffic
- Erosion of freight traffic from rail
- Increased use of large trucks in retail delivery role
- Campaigning by environmental organisations: Civic Trust '*Heavy Lorries*' (1970)



Initiatives

Dykes Act (1973) on Lorry Routing

Lorries and the Environment Committee (1974-79)

Pettit Inquiry (1973)
'Lorries and the World We Live In'

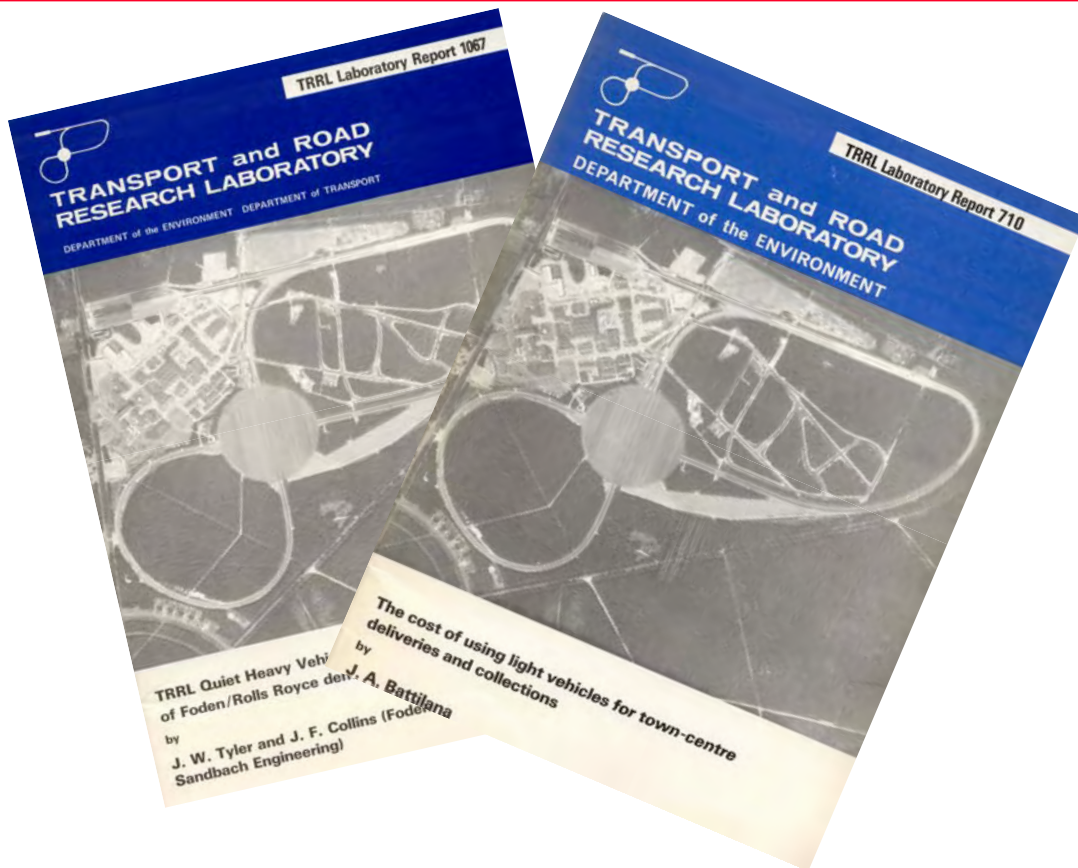
Armitage Inquiry 1980

Report of the Inquiry into Lorries, People and the Environment

December 1980

Presented to the Minister of Transport, the Rt. Hon. Norman Fowler MP, by Sir Arthur Armitage MA LLB LLD

LONDON
HER MAJESTY'S STATIONERY OFFICE
£5.50 net



- Quiet heavy vehicle
- Urban freight studies
- Empty running by lorries
- Lorry routing schemes
- Public perception of lorries

Many Small versus Few Big Dilemma

Some environmental costs correlate strongly with vehicle numbers:

e.g. air pollution, noise and accident risk

Others correlate mainly with vehicle size and weight:

e.g. vibration, accident severity, visual intrusion



1 x 16 tonne load



2 x 8 tonne loads



4 x 4 tonne loads

Testing Public Perceptions of Vehicle Size



330 people interviewed in two towns

Inconclusive result:

'no clear preferences can be established'

4 small and 1 large vehicle combinations were equally disliked.

2 medium sized vehicles were the least disliked

Urban Freight Studies

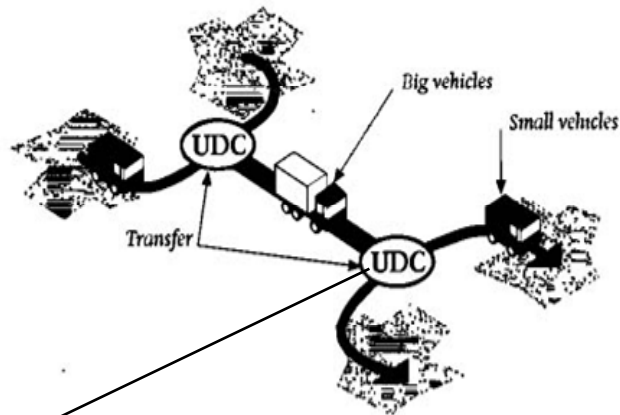
1970s: 'heyday of the urban freight study'

Differing emphasis:

North America: load consolidation – 'small order problem'

Europe: load disaggregation – 'ban large vehicles from towns'

Urban transshipment



Urban Distribution Centre

feasibility studies

Location	Date	Consultant / Researcher
Hammersmith	1974	Metra Ltd.
Camberley	1975	CIDP Ltd.
Chichester	1975	Lichfield and Assocs
Bradford	1975	WYTCONSULT
Swindon	1976	Transport and Road Research Lab. (TRRL)
Hull	1976	Lorries and the Environment Committee
Barnsley	1976	Urquhart (PhD thesis)

- Greater London Council:
 - freight on freight consolidation and freight complexes
 - Wood Inquiry into the night lorry ban
- Impact of warehousing development (Dept of the Environment)
- Development of intermodal transport ('combined transport')

Industry Initiative: Greening of the ILDM 1993

LOGISTICS AND THE ENVIRONMENT

Volume 3



The Institute of Logistics
and Distribution Management

Analysing the environmental impact of logistics

Establishing environmental best practice

Promoting adoption of green practices

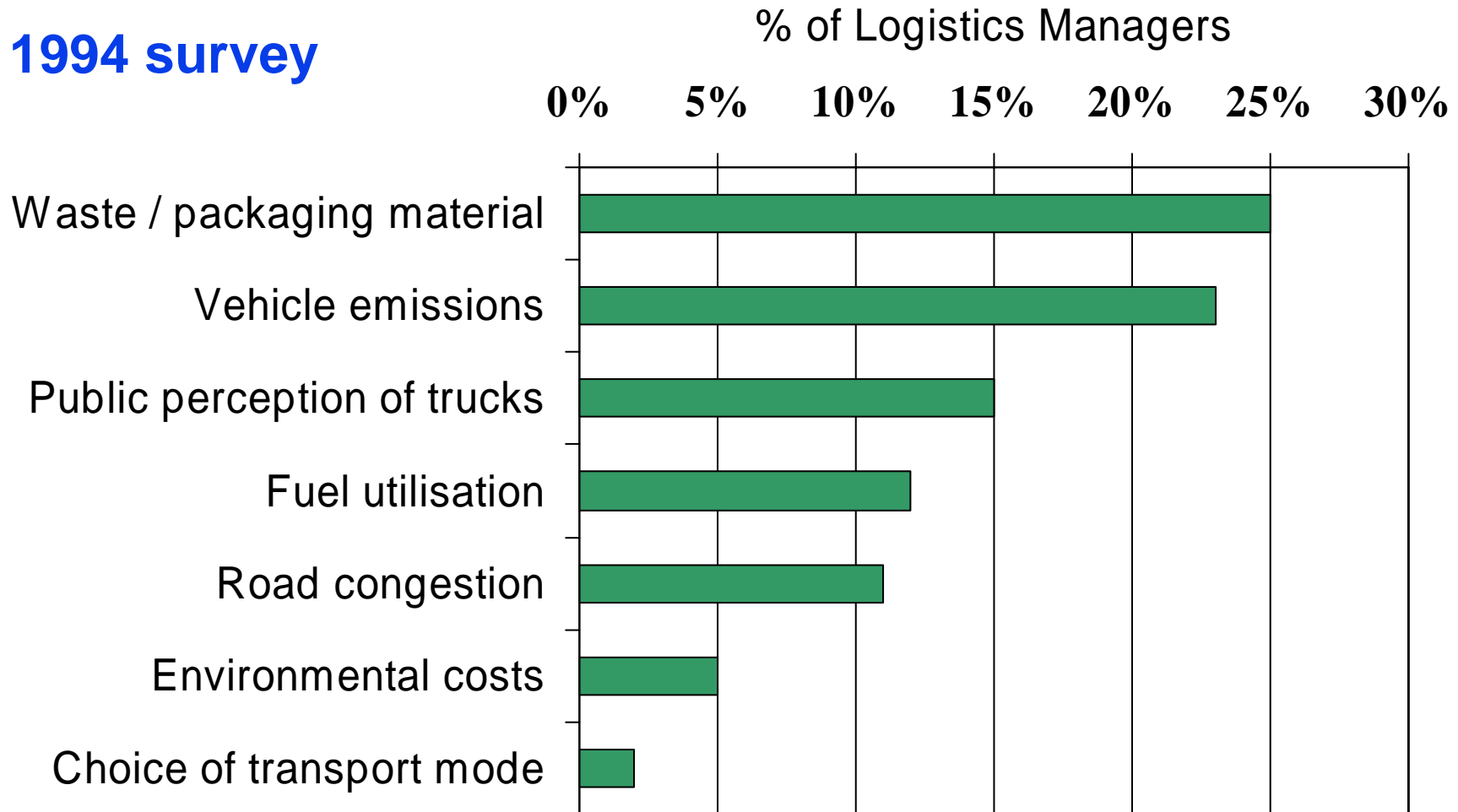
Heading-off tougher government regulation



78% of logistics managers
considered the EU to be
the main source of
pressure to green logistics
operations

Importance of Environmental Issues to Logistics Managers

1994 survey



Source: PE Consulting / Institute of Logistics

Local Environmental Impact of a Distribution Centre

Intrusion:

Visual Air Noise

Energy generators
refrigeration units

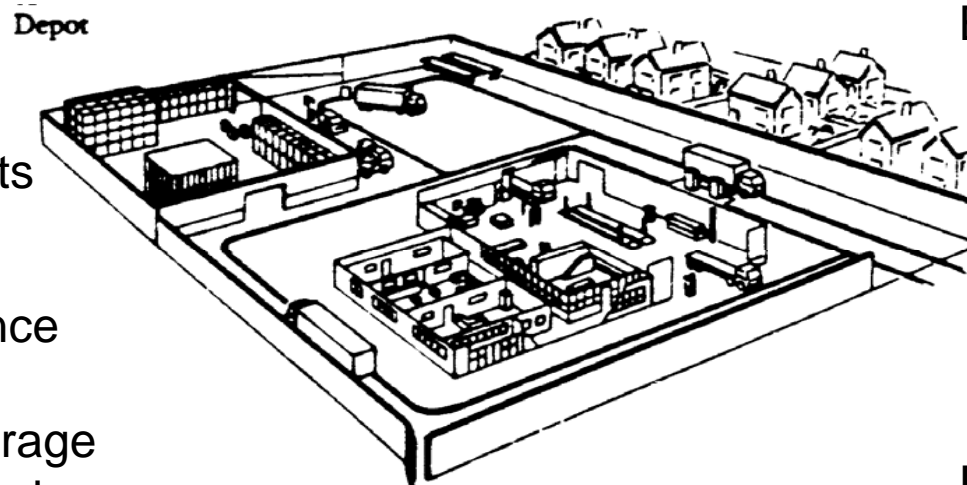
Maintenance storage
fuel/oil storage
vehicle wash
parking

Time
Distance
Wind
Seasonal

Contamination

Water Land

Waste oil
chemicals
litter



Risk

Safety Fire Property

Effects on residences

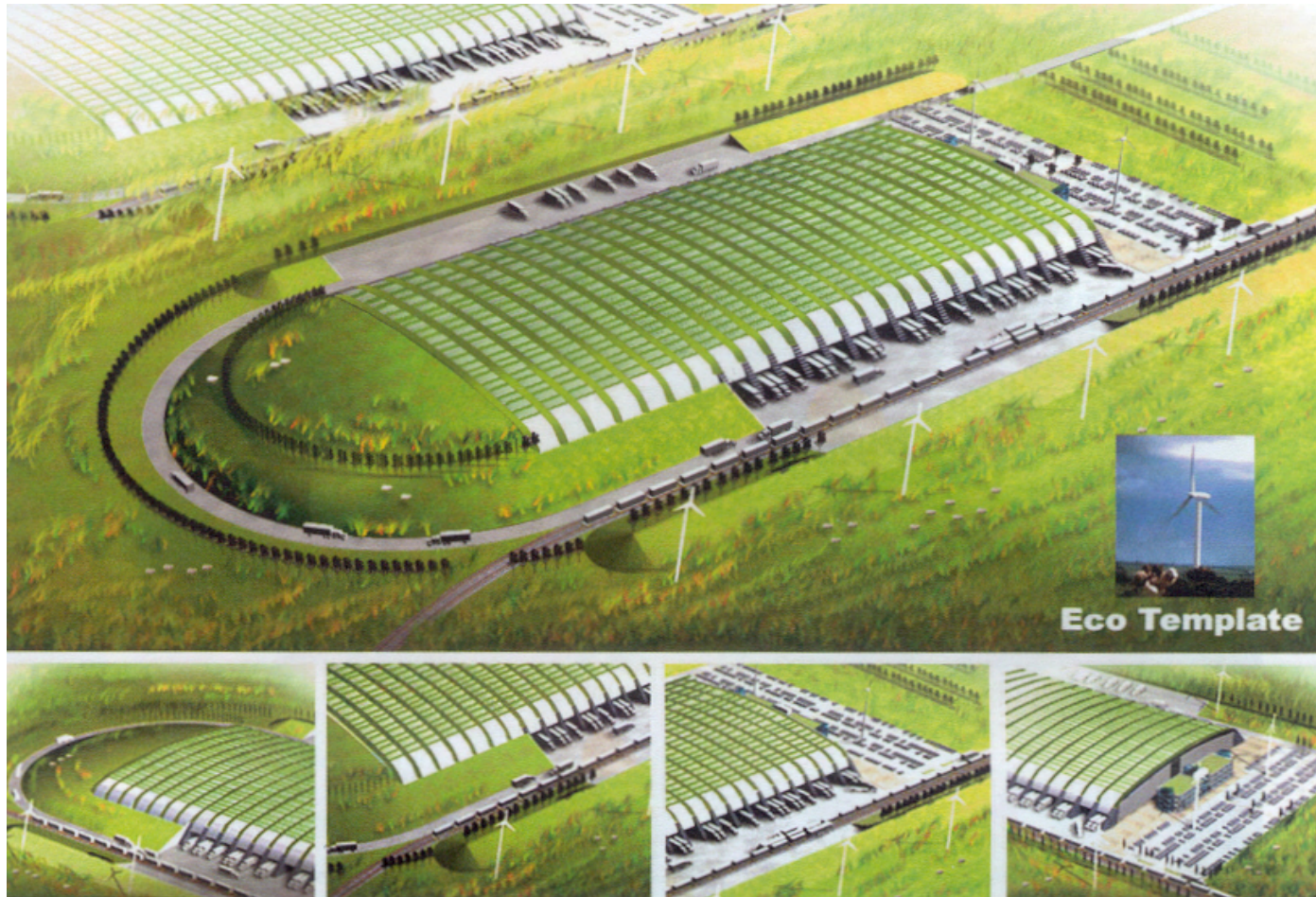
Vehicle routes
site access

External depot

Security
Lights;
Load speaker

Source: Worsford / Department of Transport

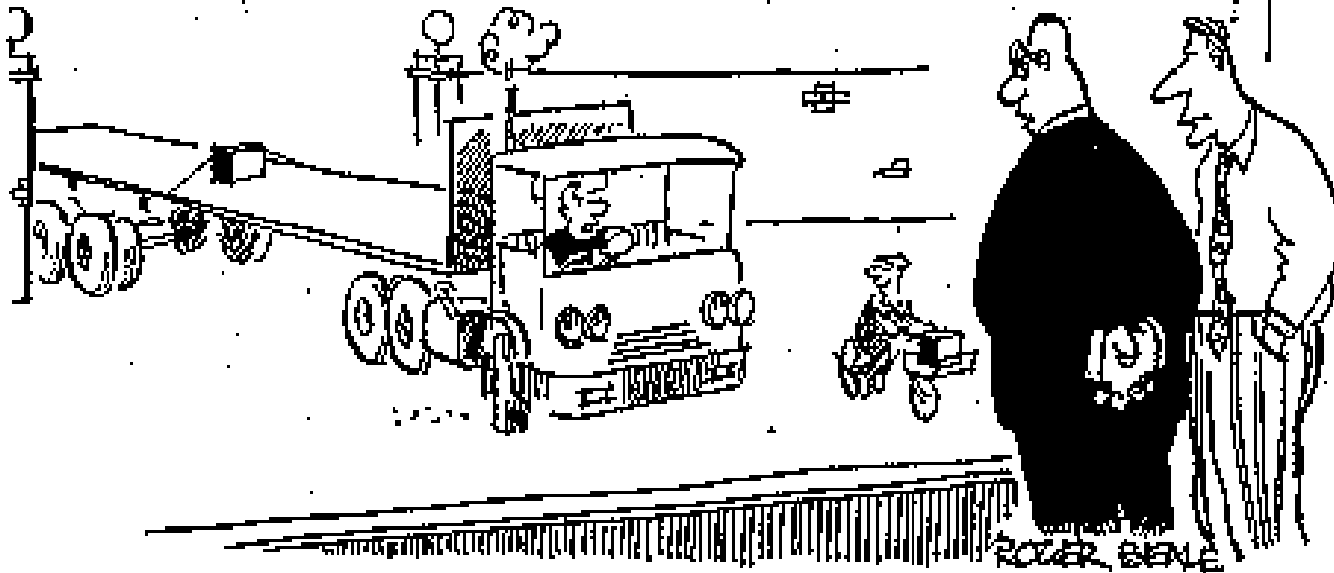
The Landscaped Warehouse



Source: *Logistics Manager* 1/2005

Just-in-Time Delivery: the environmental impact

Some suppliers have adapted better than others to the disciplines of just-in-time delivery



- Funded research at Heriot-Watt and Cranfield on the relationship between logistics trends, freight traffic growth and environmental impact
- Developed new frameworks for the analysis of this relationship and conducted extensive surveys of logistics managers in different industrial sectors
- Formed the basis for later EU 4th and 5th Framework research projects on links between logistics and freight traffic growth at a European level: REDEFINE and SULOLOGTRA

Supply chain **LOG**istics **TR**ansport

Support for research on many aspects of Green Logistics

REDEFINE

Infredat

STEMM

Sulogtra

Possum

Trilog Europe

Emma

Stella

Sprite

BEST



Effect of Transport Cost Increases on the Optimum Number of Distribution Centres

Level of Road Transport Costs

<i>Value Density</i> <i>£/tonne</i>	<i>Typical Product</i>	Present Level		+50%		+100%		+150%		+200%	
		W	D	W	D	W	D	W	D	W	D
50	Cement	3	3	3	3	3	3	7	10	7	10
100	Compound Fertiliser	3	3	3	3	3	3	7	10	7	10
500	Paper	3	3	3	3	3	3	6	3	7	10
1000	Cakes	3	3	3	3	3	3	3	3	7	7
5000	Stainless Steel Sinks	2	2	2	2	2	2	3	3	3	3
10000	Clothing	1	1	2	2	2	2	2	2	2	2
20000	Personal Computers	1	1	1	1	1	1	1	2	2	2

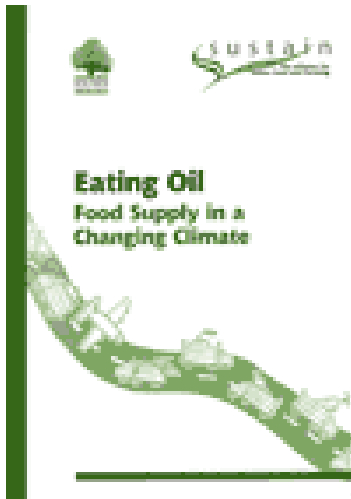
W = Weekly Delivery

D = Daily Delivery

Optimum number of distribution centres to supply the UK

The Food Miles Issue

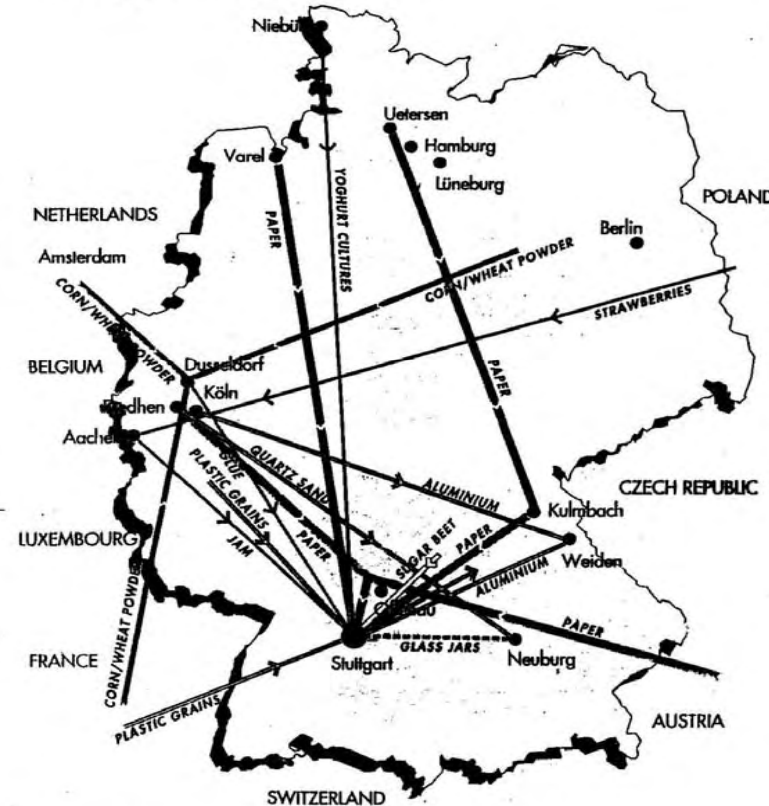
SAFE Alliance:
'Food Miles Report' (1994)



Transportation Relationships

STRAWBERRY YOGHURT

Showing the main transportation of materials for the manufacture of 150g pot of strawberry yoghurt



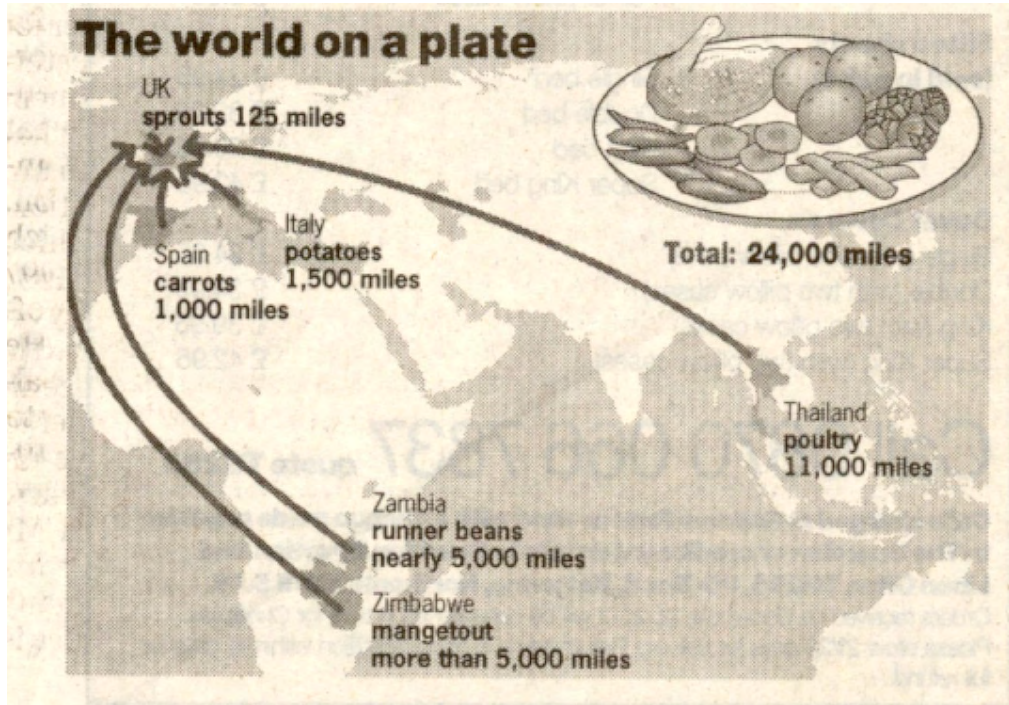
Transport Intensity and environmental impact of the yoghurt supply chain

For every pot of yoghurt sold in a German supermarket a truck travels 9 metres

S. Boge, Wuppertal Institute 1993

'Food Miles' Issue

Effect of Globalisation on the Christmas Dinner



Guardian 11 Dec 2001



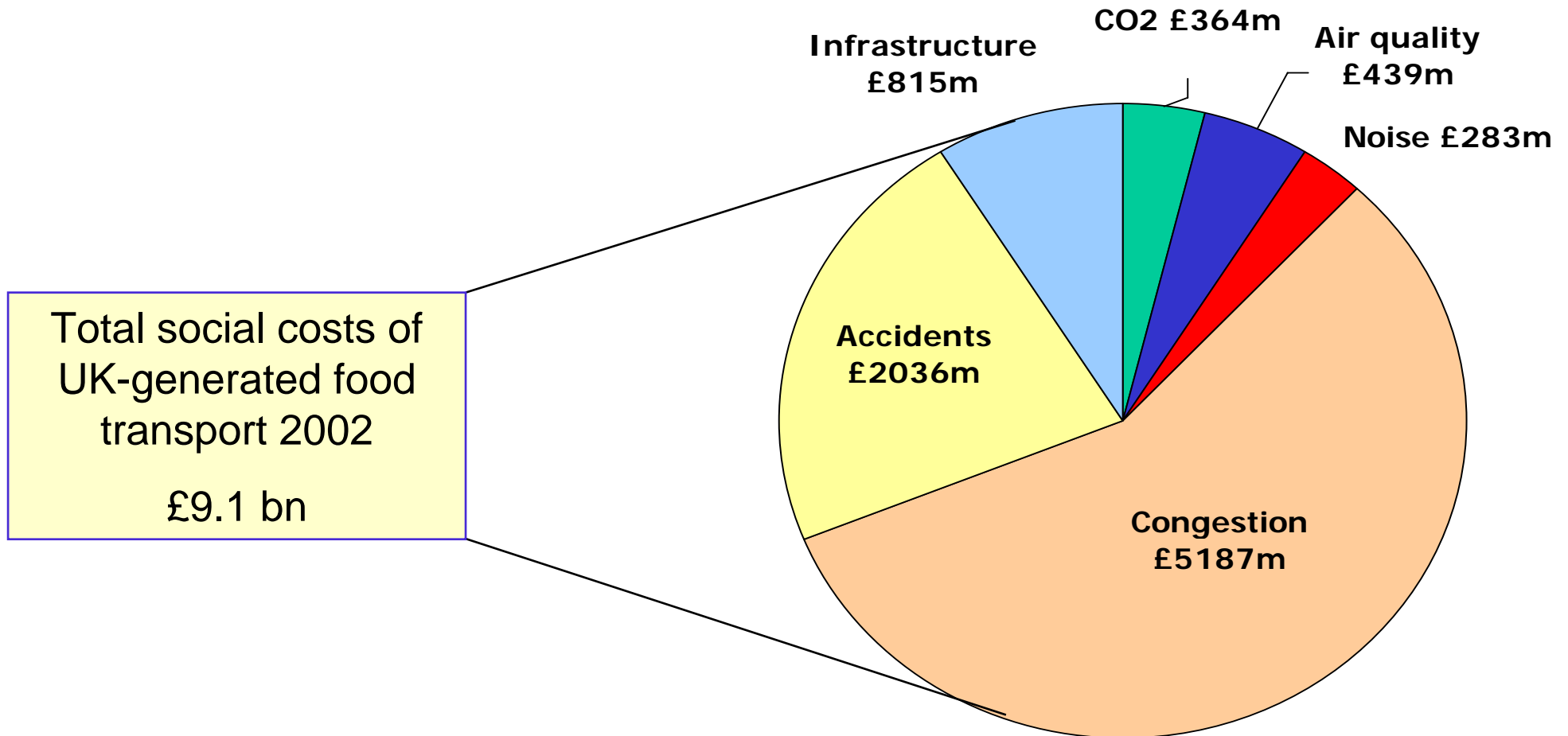
The Validity of Food Miles as an Indicator of Sustainable Development

Final Report produced for DEFRA



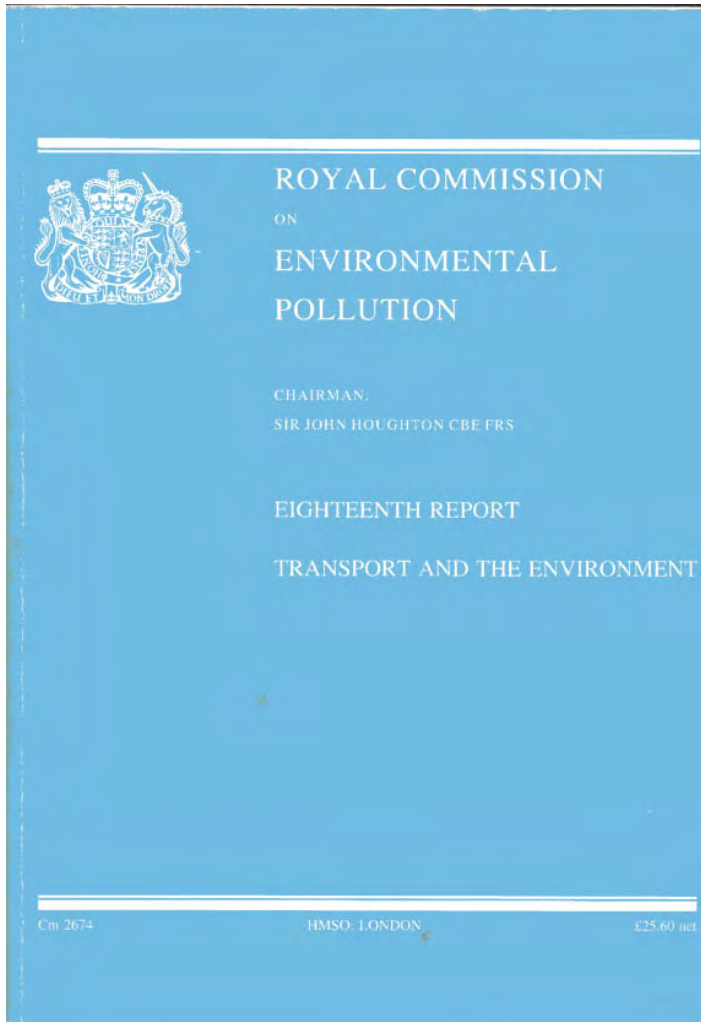
Bottled water airfreighted to the UK from Fiji

Social Costs of Food Transport



Source: AEA Technology et al 2005

Royal Commission on Environmental Pollution 1994

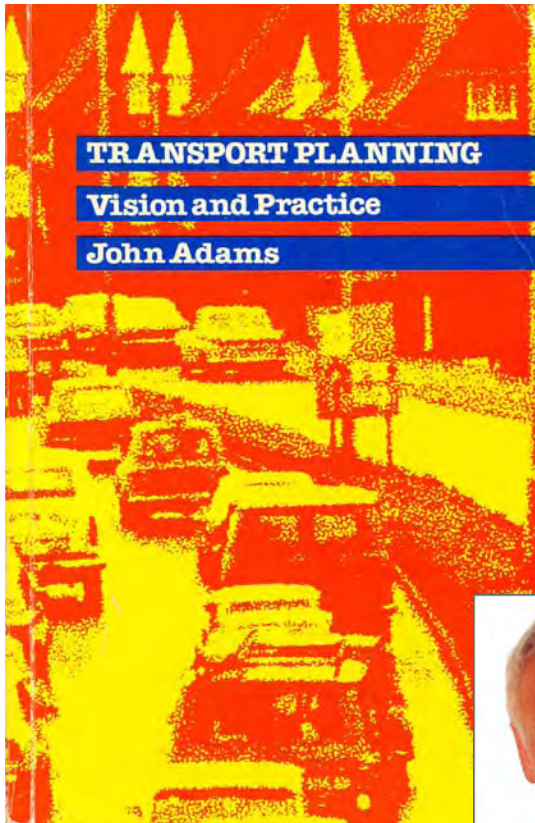


‘We recommend that all urban authorities adopt a presumption against access for HGVs over 17 tonnes’

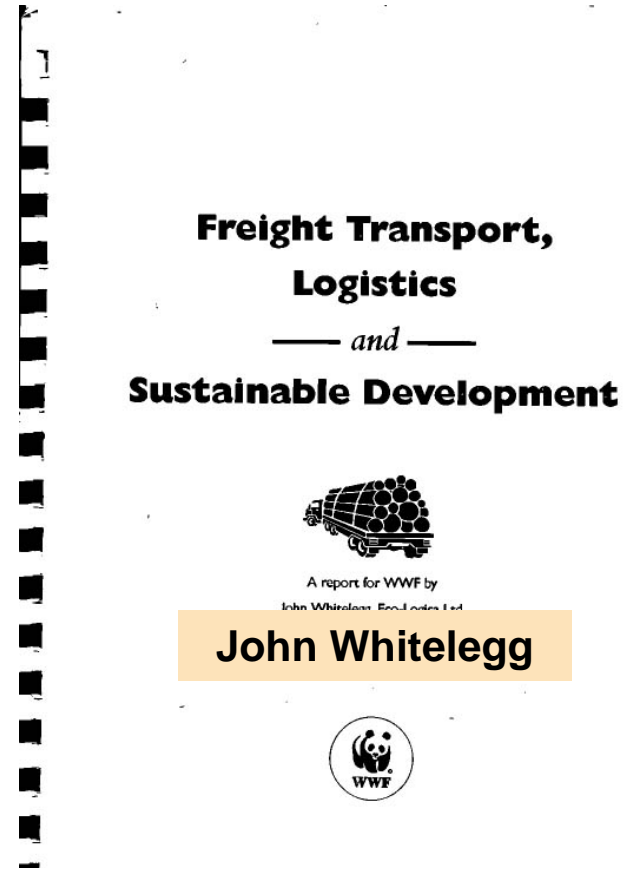
‘The target we propose for rail is to increase the proportion of tonne-kms carried by rail from 6.5% to 10% by 2000 and 20% by 2010’

‘We believe a sustainable transport policy would be based on growth of no more than 10% a decade in overall demand for freight transport over the next 30 years.’

Challenging Freight Transport Planning Orthodoxy



Fallacy of 'predict and provide'



'Freight absurdities - the movement of goods over large distances for no apparent reason...need to curb the rise in pointless freight transport'

Weak versus Strong Sustainability

Weak sustainable development:

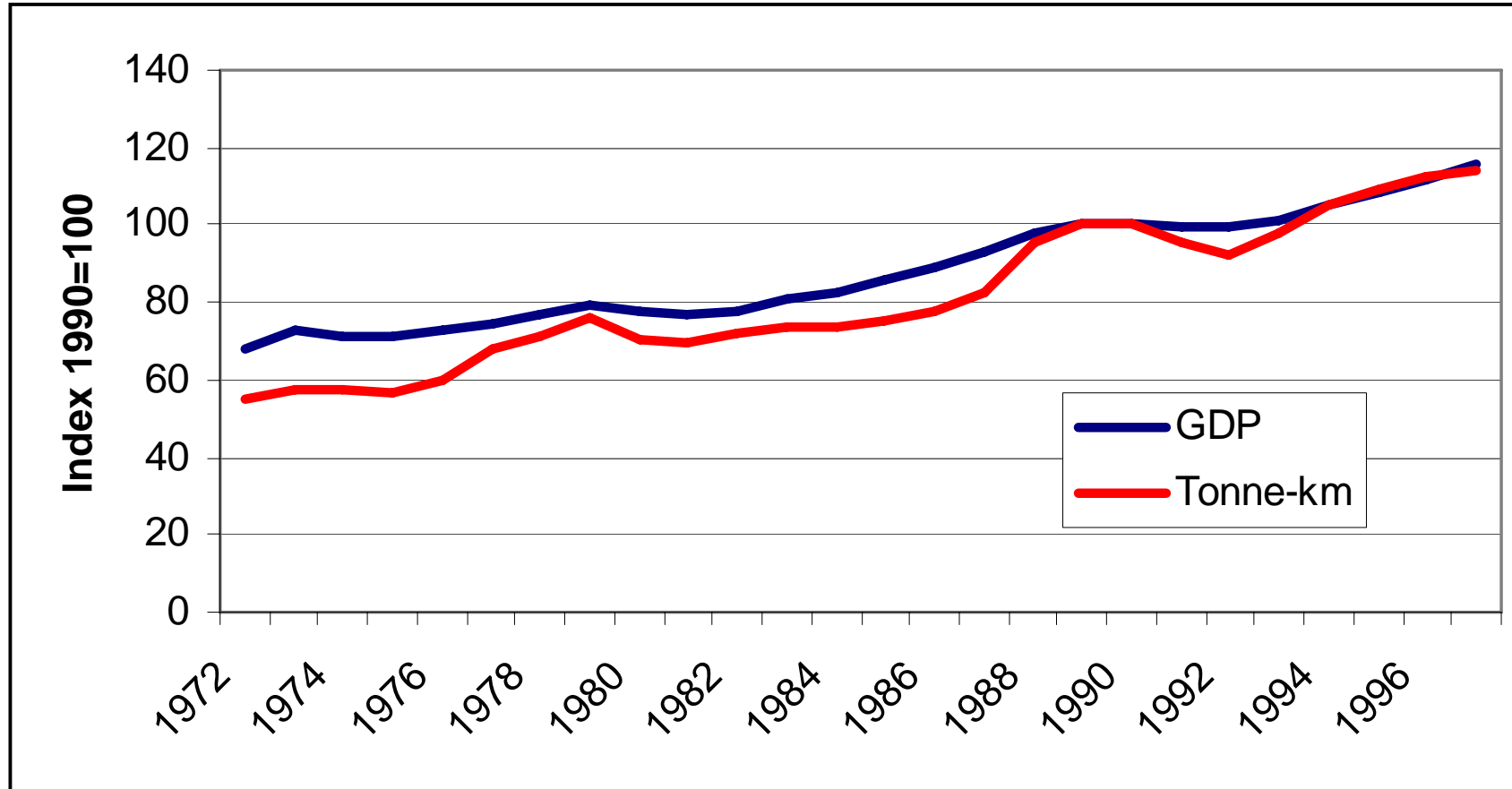
- environmental objectives are traded-off against economic and social objectives

Strong sustainable development:

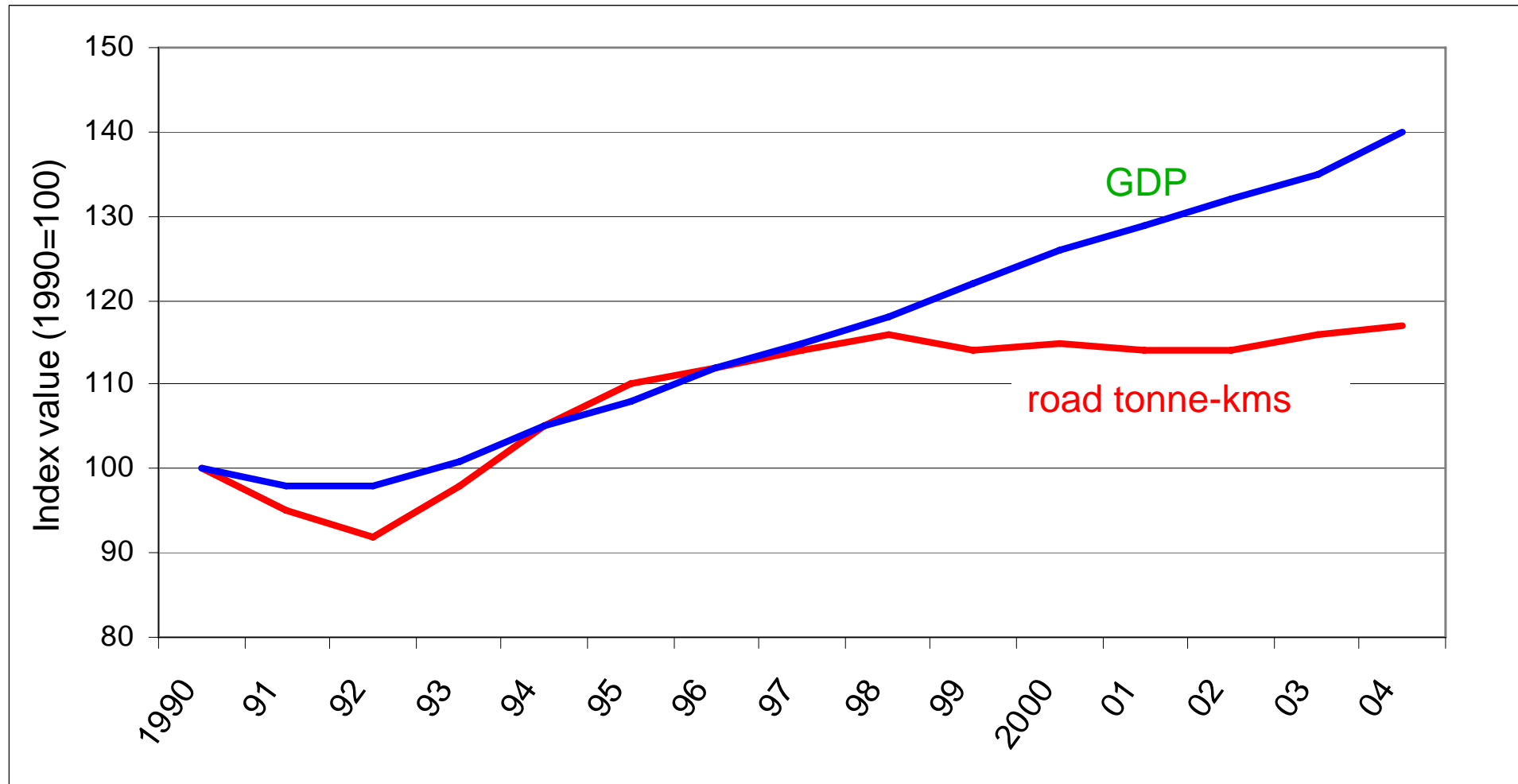
- environmental considerations impose an absolute constraint on the achievement of economic and social objectives

Source: Whitelegg, 1995

Close Correlation between Economic Growth and the Growth of Road Freight Transport



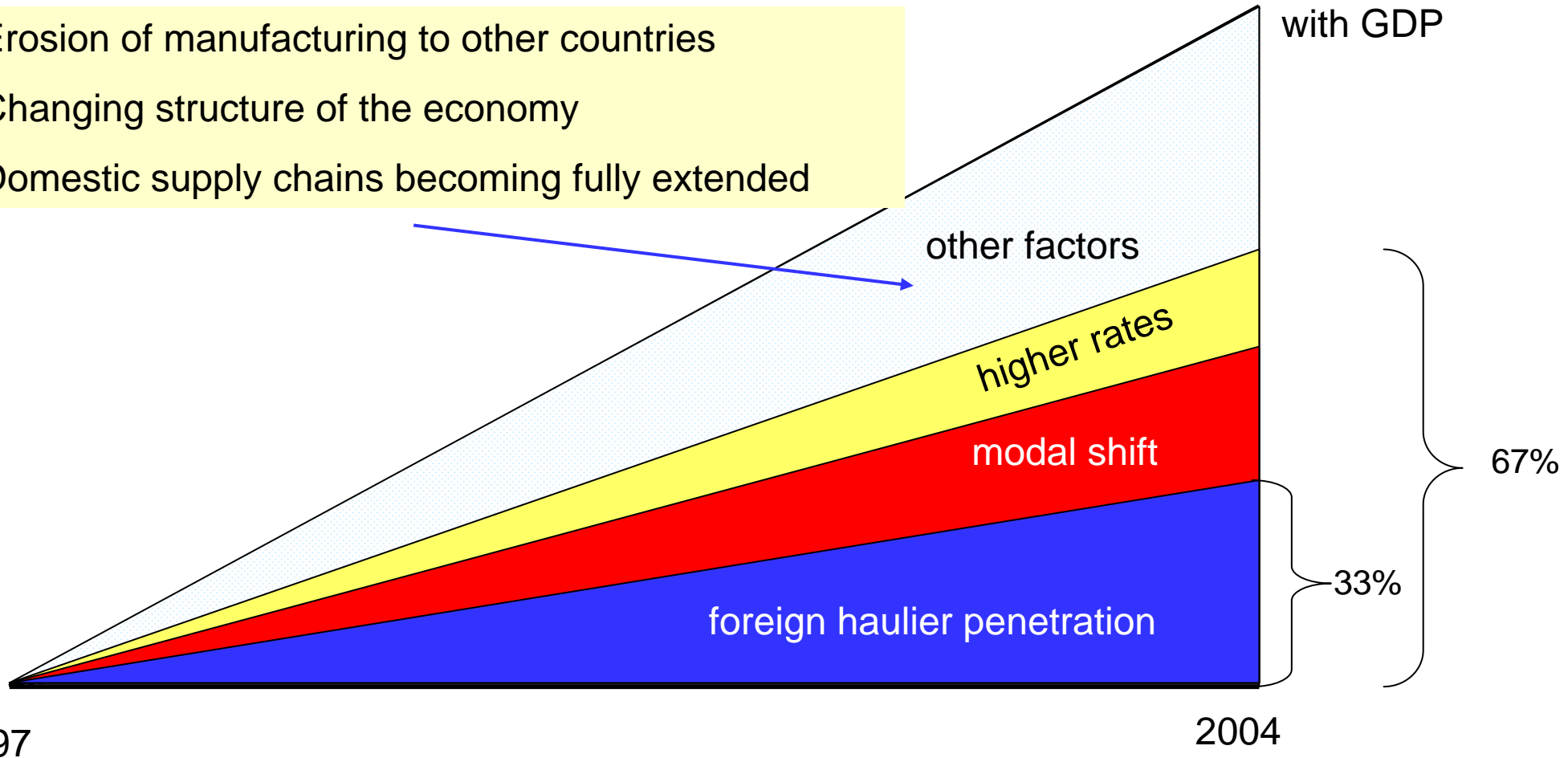
Decoupling of road tonne-km GDP trends



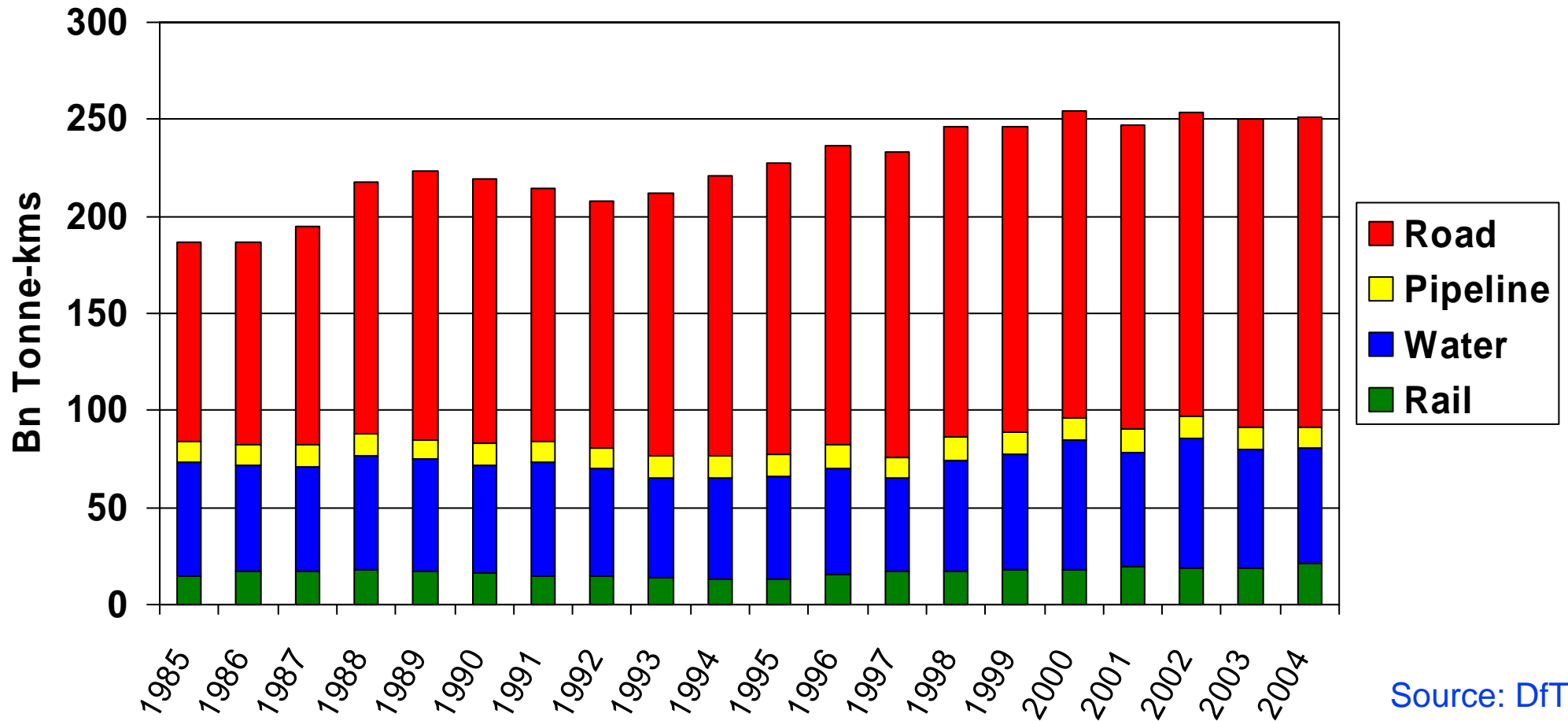
Factors Contributing to the Decoupling

Erosion of manufacturing to other countries
 Changing structure of the economy
 Domestic supply chains becoming fully extended

Tonne-kms in line with GDP

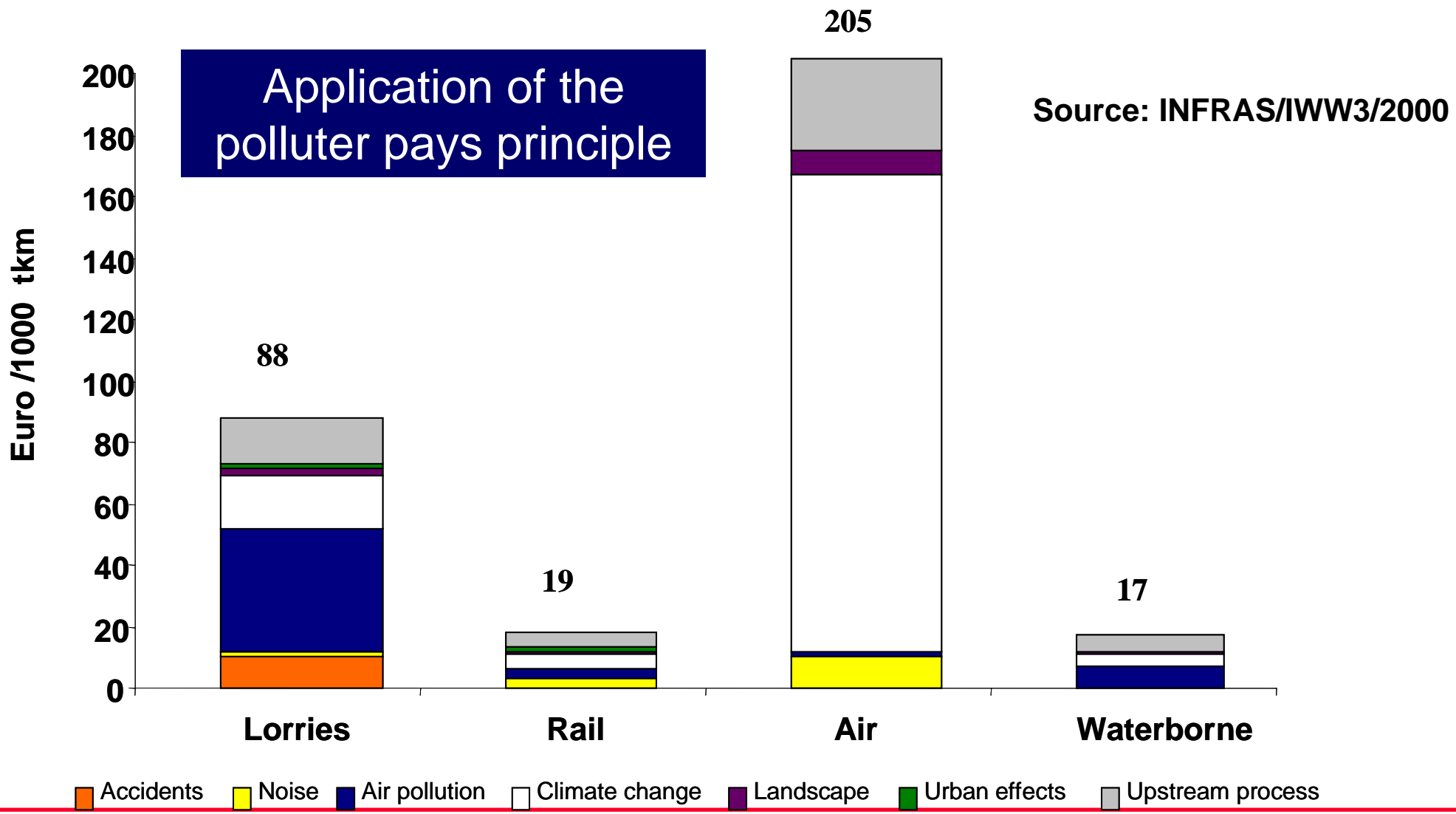


Freight Modal Split 1985-2004

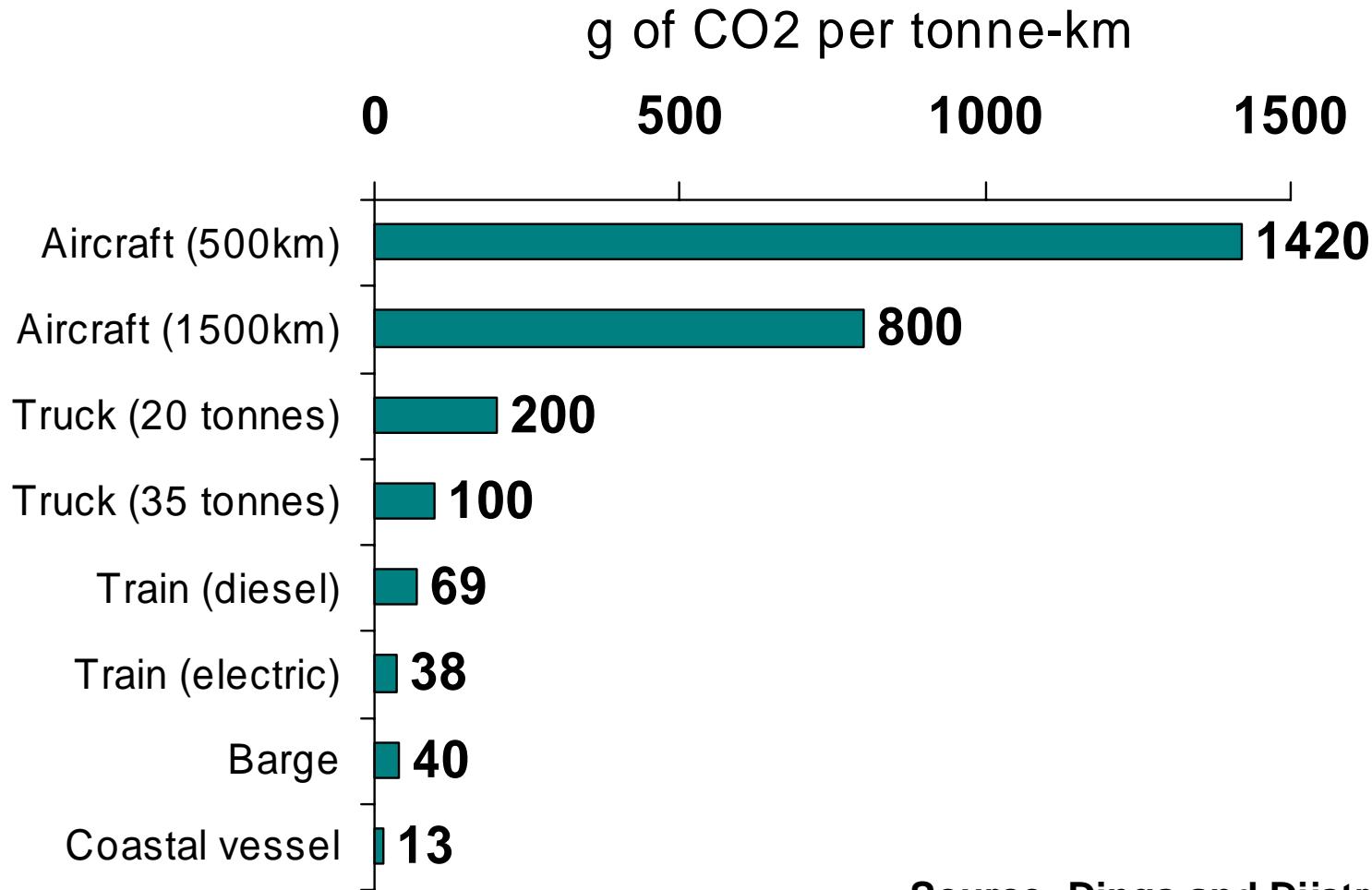


Source: DfT

Average External Costs of Different Transport Modes in EU



Variations in CO₂ Emissions per Tonne-km by Mode



Source: Dings and Dijstra (1997)

Research on Freight Modal Split

- Bayliss and Edwards '*Industrial Demand for Transport*' (1969)
- Numerous research papers and theses on freight modal split issue
- Innovative methodologies developed: *stated preference models*
Leeds Adaptive Stated Preference (LASP) model
- Development of new multi-modal freight forecasting tools

'Marine Motorways'



New Initiatives on Packaging Waste



Reverse Logistics

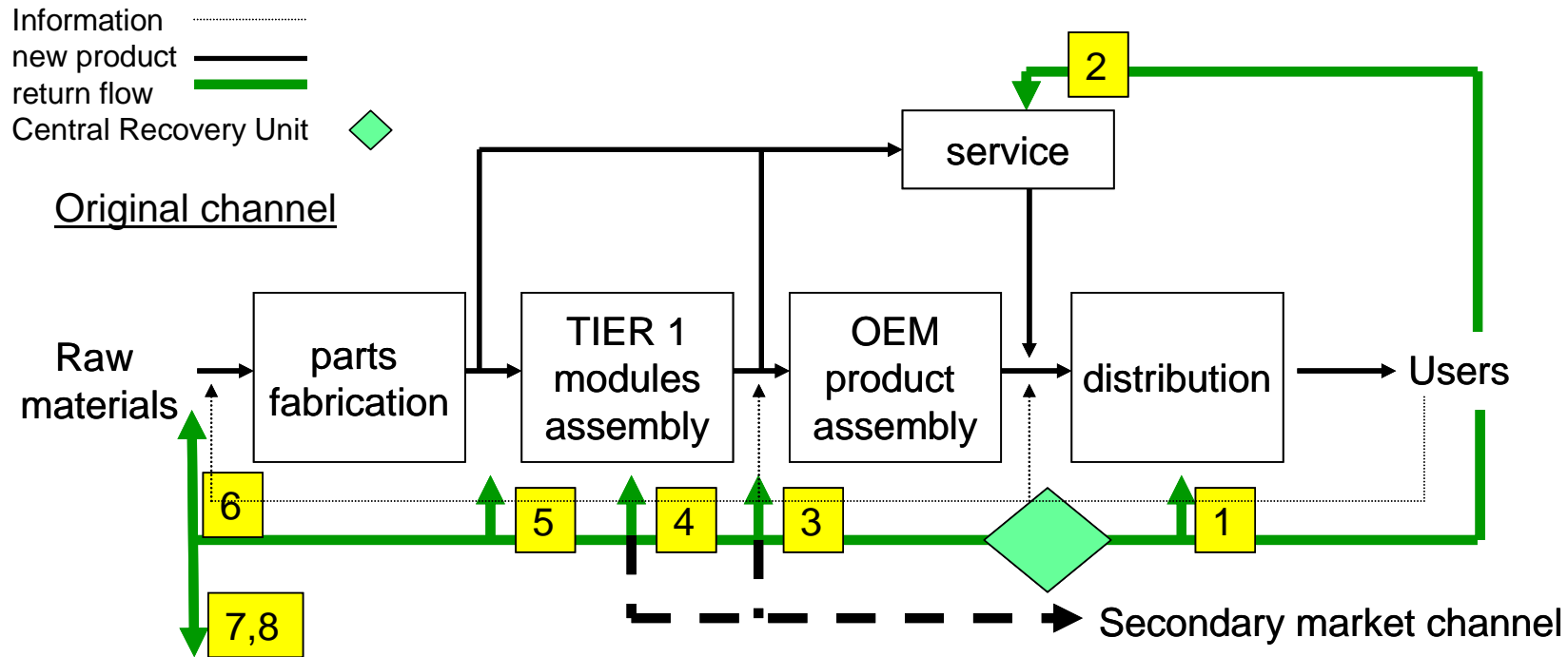
- packaging waste directives in Europe
- growth of interest in returnable packaging
- Jim Stock's CLM White Paper on 'Reverse Logistics'
- US academics associate Green Logistics with Reverse Logistics

'The movement of materials from the earth through production, distribution and consumption back to the earth.'

Jonathan Weeks (1996 chairman of the Institute of Logistics)

- impact of the recycling of packaging waste on freight transport system
- rationalising the movement of domestic waste in urban areas

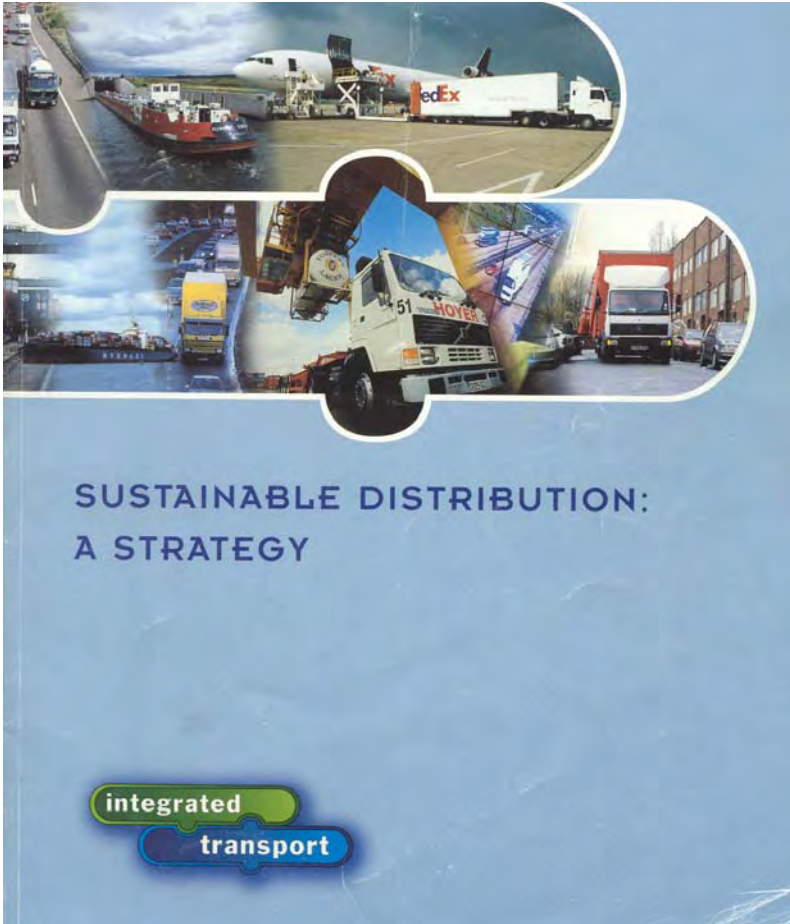
Modelling the Reverse Supply Chain



Waste Management	Product Recovery Management		Direct Reuse
7. Incineration 8. Land filling	5. Cannibalisation 6. Recycling	2. Repair 3. Refurbishment 4. Remanufacture	1. Direct reuse / resale

Source: based on Thierry et. al. Integrated supply chain (1995)

Research on Sustainable Distribution



- Identified new research areas
- Promise of a new journal of sustainable distribution research
- Future Integrated Transport research programme:
 - *5 freight projects out of 44*
- Formation of the Freight and Logistics Research Group
- Funding of research to support TransportEnergy Best Practice Programme

- Best practice initiatives
- Support for industry-led benchmarking schemes
- Advisory programmes

Transport KPI programme

Key Performance Indicators surveys:

Food supply chain

Pallet load networks

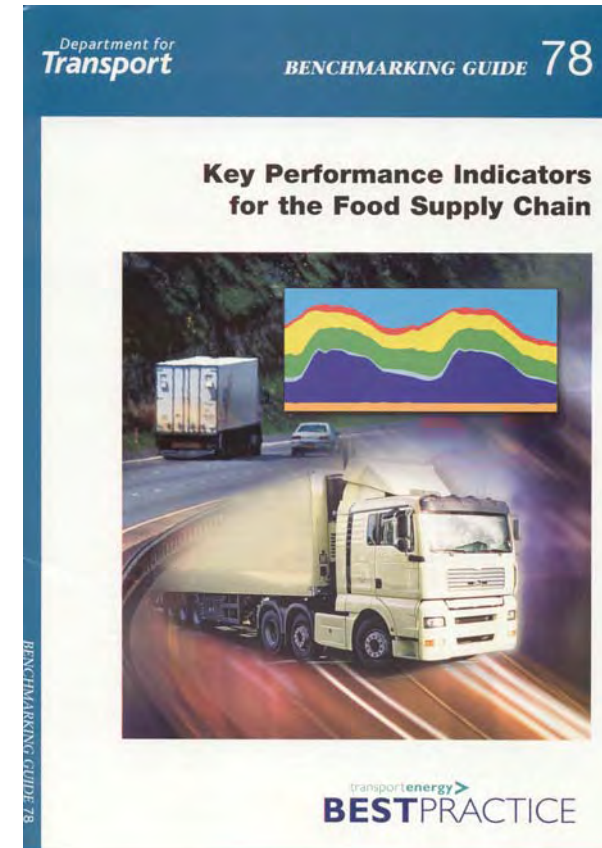
Automotive supply chain

Parcel delivery network

Non-food retail distribution

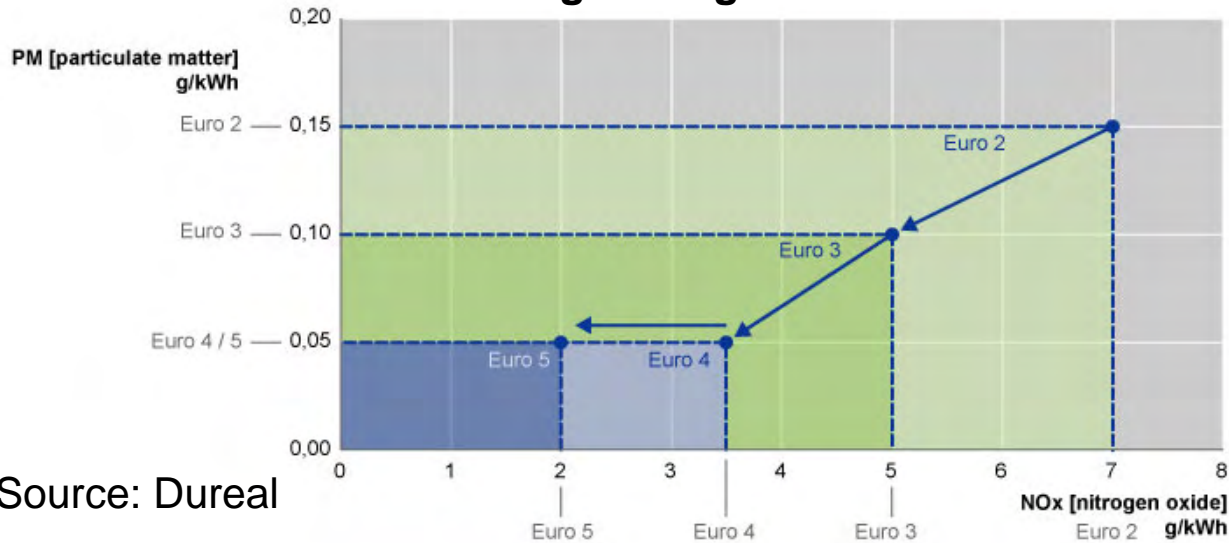
Construction supply chain

- ‘synchronised audits’ over 48 hour periods
- benchmarking of vehicle utilisation and energy efficiency



Greening of Road Freight Transport

Effects of Tightening Euro-emission Standards



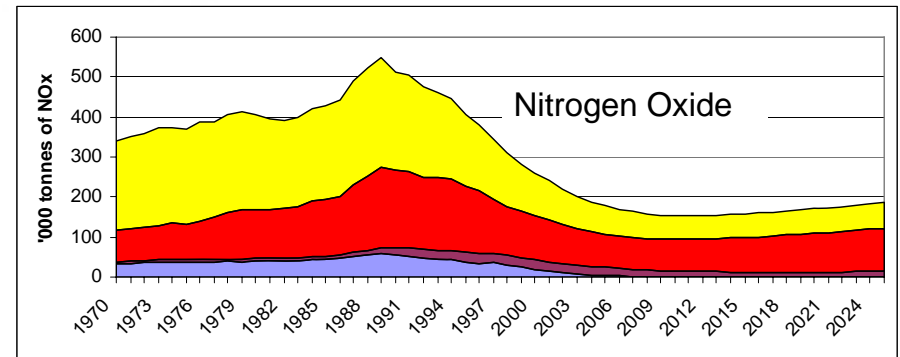
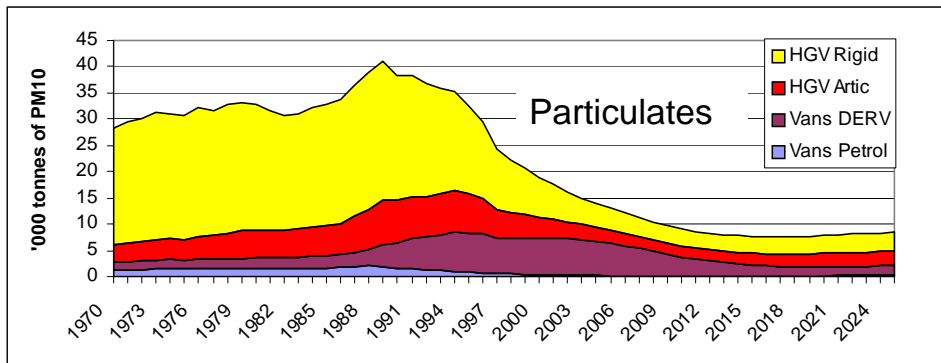
Projected Emissions from Road Freight Operations in the UK



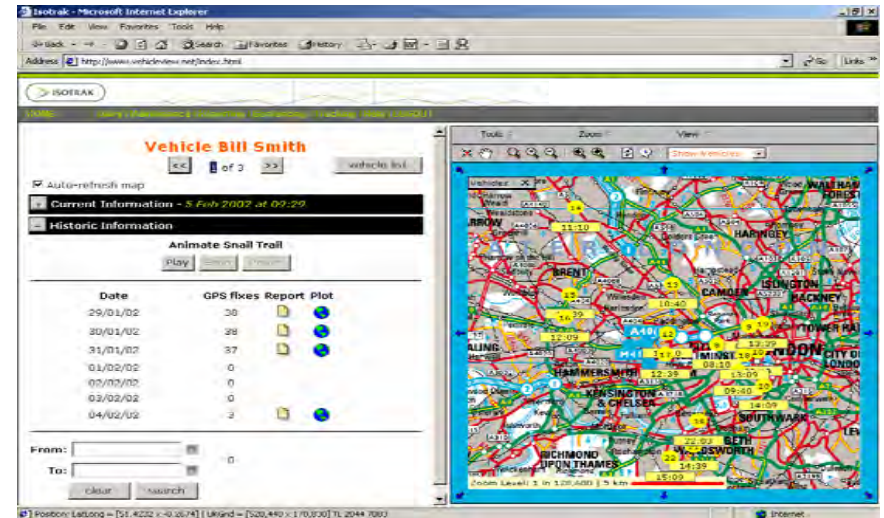
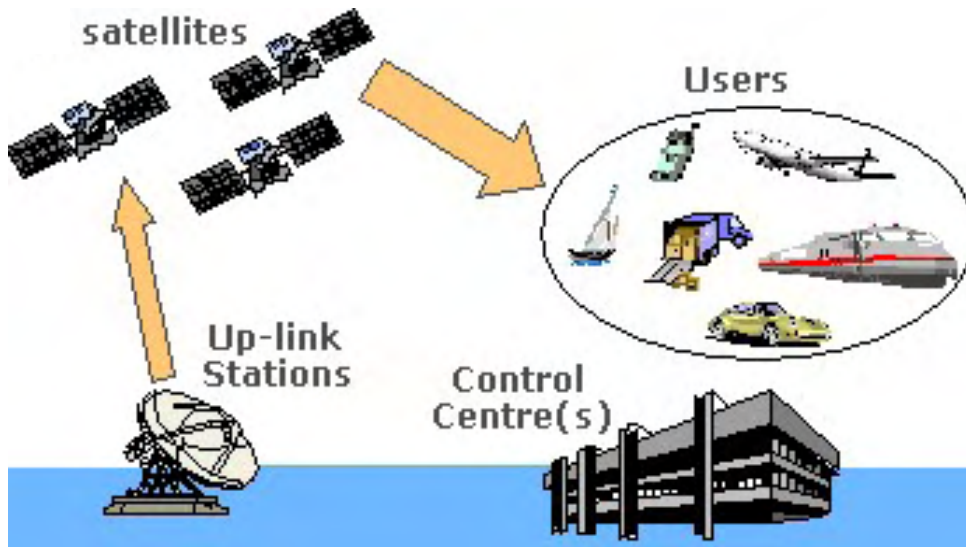
Source: UK Dept for Transport

Source: Dureau

EURO-Emission Norms



Vehicle Telematics and Routing Systems



- Cutting vehicle kilometres
- Minimising exposure to traffic congestion
- Cutting fuel consumption and CO2 emissions
- Permitting more environmentally-sensitive charging systems

Press and Public Continue to Dislike Lorries



THE EXPRESS
MICRO EDITION 5 March, 2000
NEWS CITY FEAT

NEWS [back to news](#) [next >](#)



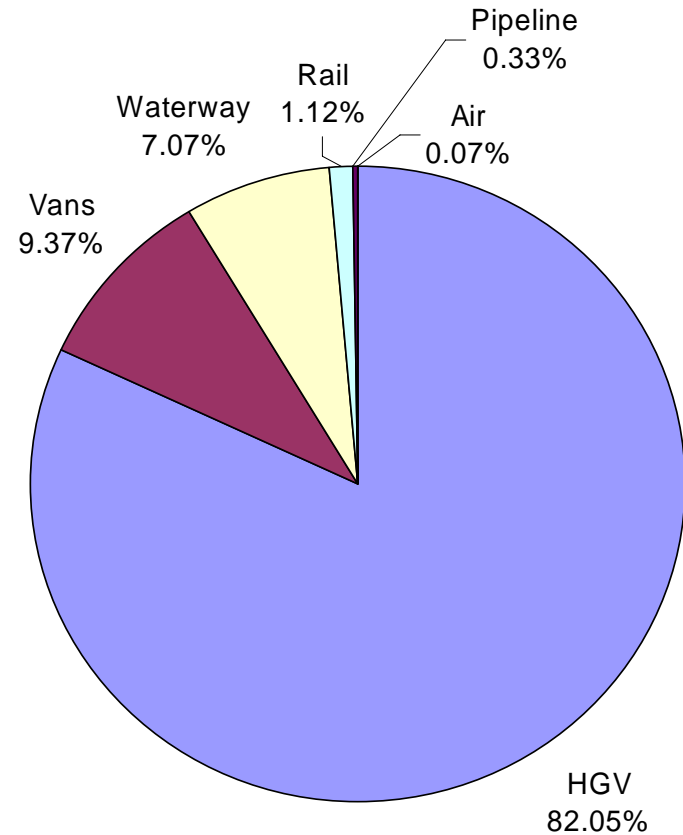
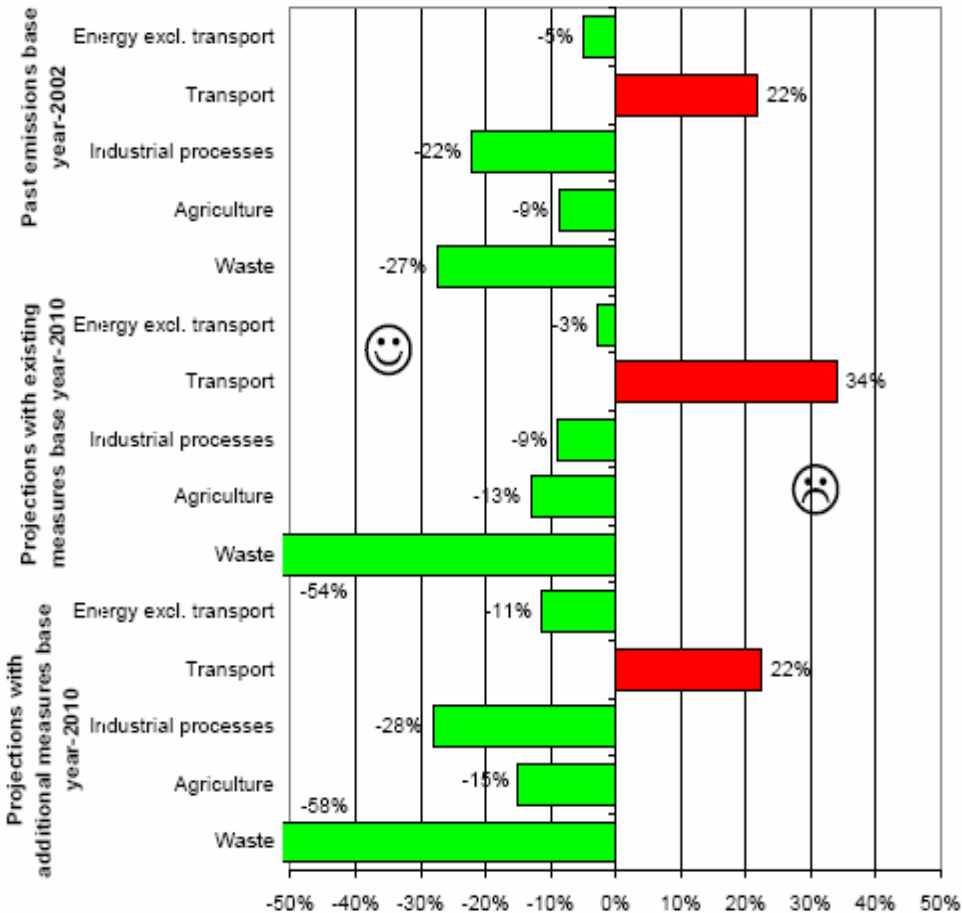
MONSTER TRUCK INVASION
By Jon Craig
Political Editor

MONSTER juggernauts could soon be thundering through Britain's towns and villages amid huge safety and

DEATH SCENE: The disaster at



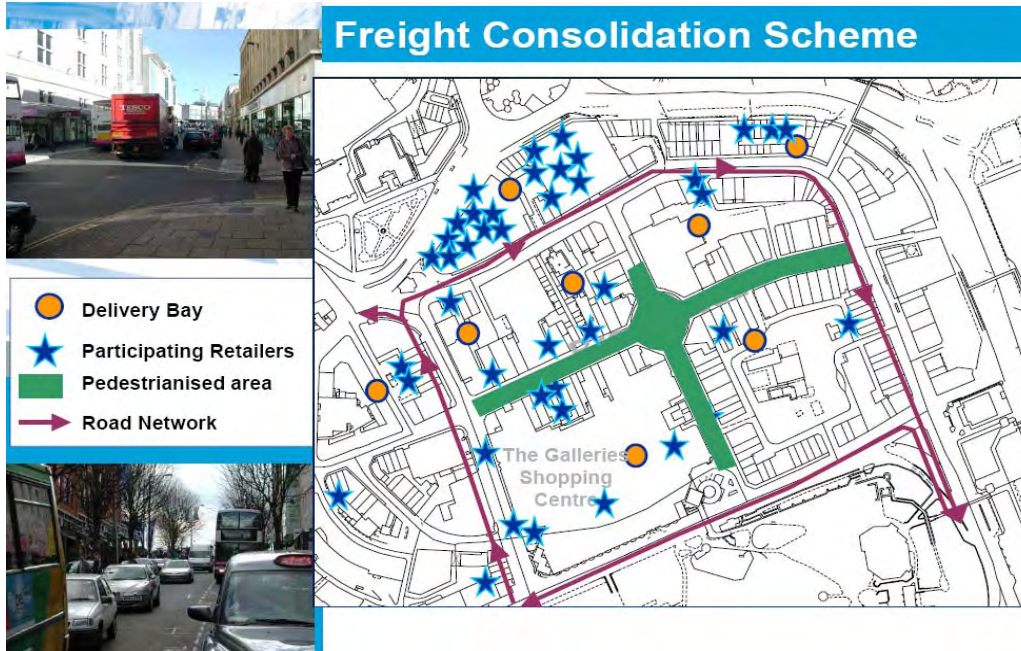
Climate Change: the New Priority



32.4 m tonnes of CO2 from freight transport
20% of all transport CO2 emissions
5% of total UK CO2 emissions

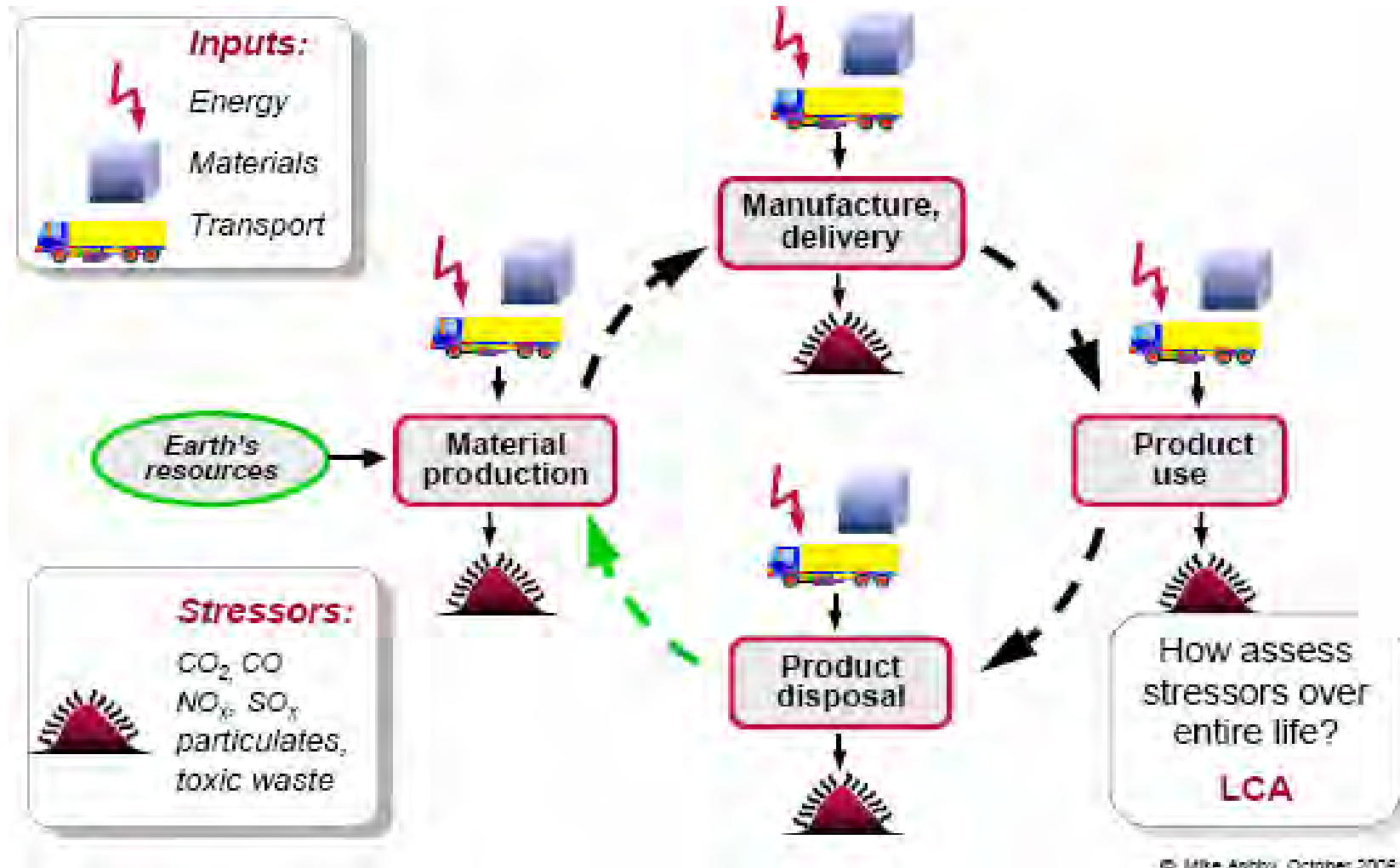
Source: Lefevere

Retail Consolidation Systems

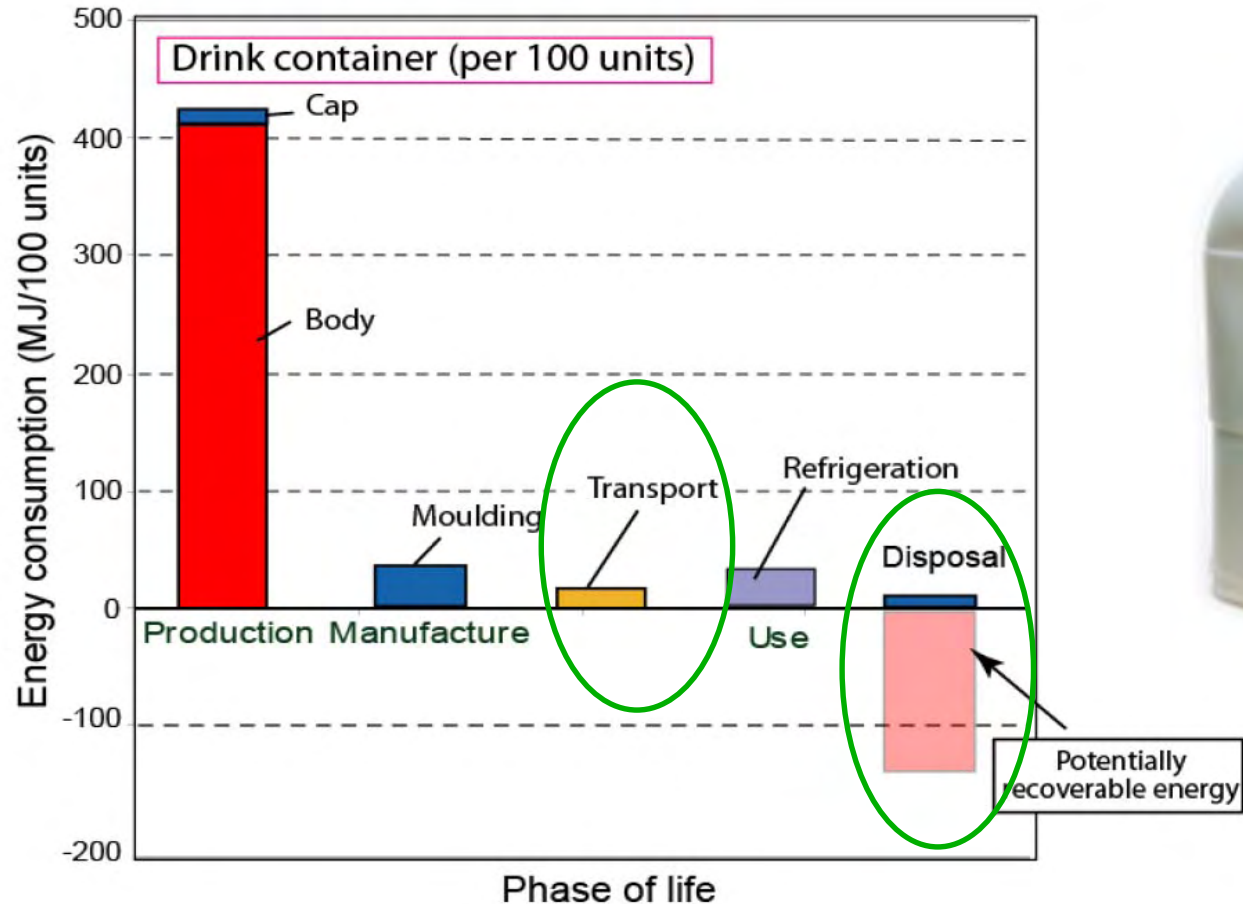


University of Westminster review of urban freight consolidation for DfT

Development of the Life Cycle Approach

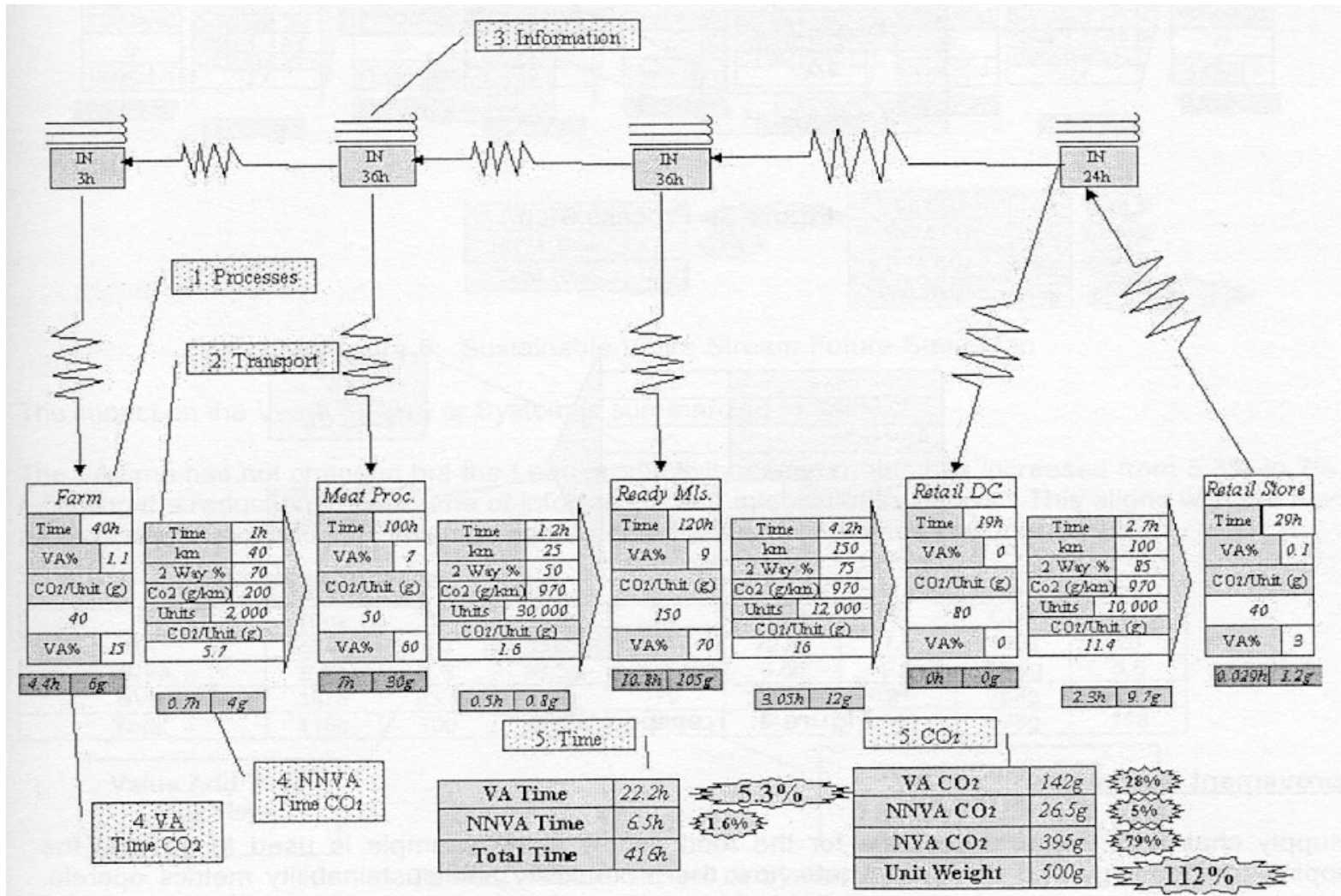


Logistics Contribution to Total Externalities



Need to minimise 'embedded carbon' in products

Use of Supply Chain Mapping Tools to Measure CO₂ Emissions



University of
Cardiff, 2004

Applying Lean Supply Chain Principles on CO₂ Emissions

Analysis of a food supply chain in the UK

Concluded that leaner supply chains also had lower CO₂ emissions

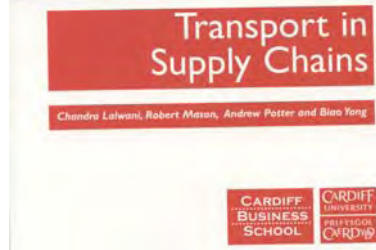
	Current State				Future State			
	Time	%	CO2	%	Time	%	CO2	%
VA	22.2h	5.3	142g	28	22.2h	7.0	142g	28
NNVA	6.5h	1.6	26.5g	5	6.5h	2.0	27.9g	5.5
NVA	387h	93.1	395g	79	289h	91	368g	74
Total	416h	100	564g	112	318h	100	538g	108

Value Add Time
Total Time



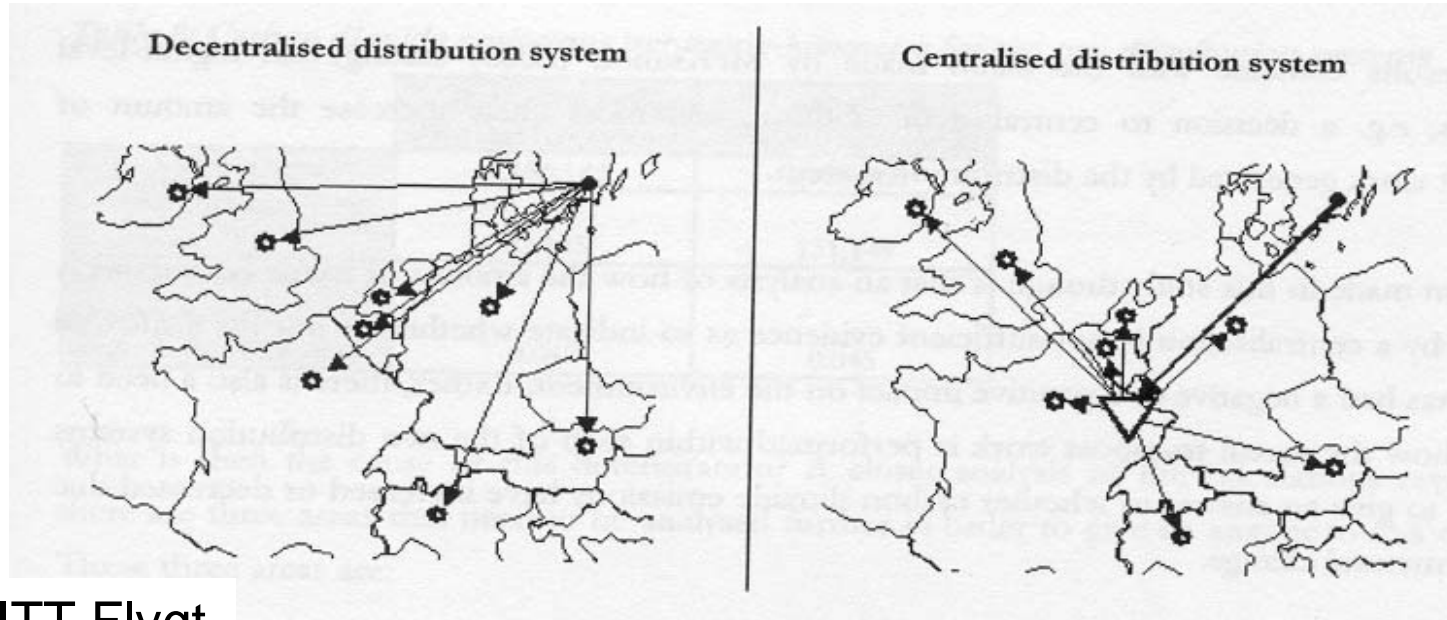
Supply Chain CO2
Unit Weight

Source: Mason et al,
Cardiff University, 2002



ITeLs Project

Impact of Inventory Centralisation on CO₂ Emissions



Case study: ITT Flygt

	Decentralised system	Centralised system
Average length of haul	1512 km	2153 km
Total tonne-kms (ann.)	2.2 million	2.9 million
CO₂ emissions (ann.)	92.2 tonnes	131.1 tonnes

Kohn 2005

Conclusions

- Research objectives evolved from curbing the HGV to wider analysis of supply chain impacts
- Emphasis shifted from localised environmental impacts to global warming
- Close involvement of government, industry and trade bodies
- Priority given to green-gold measures – weak form of sustainability
- Externalities per tonne-km in the UK have been declining
- Globally tonne-kms are increasing – exporting the pollution problem
- Sharp increase in corporate awareness of environmental issues
- Plenty work still to be done.....

Contact details

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<http://www.sml.hw.ac.uk/logistics>