

Public Lecture

Collective Solutions for Lower Carbon Mobility: a European Perspective

CEPT University, Ahmedabad
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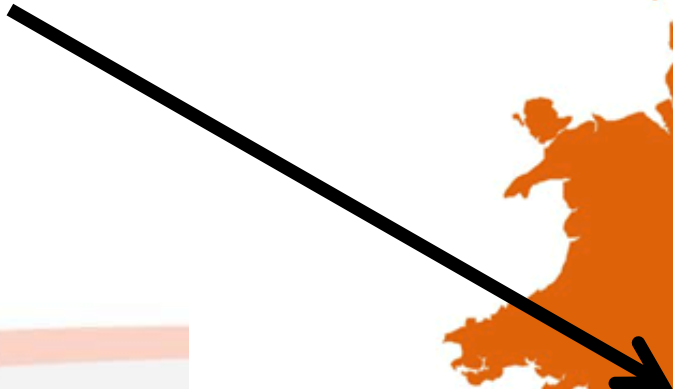
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University of the
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Centre for Transport & Society



- **Aims**

- improving our understanding of travel behaviour
- promoting more equity in mobility
- developing innovative transport research methodologies

- **Themes**

- technologies and travel
- experience of the travel environment
- reducing car dependence
- promoting inclusive, low carbon, active travel
- mobility and the ageing population
- supporting and evaluating sustainable mobility strategies

Lecture Narrative

- European Union has a particular responsibility to take a lead on carbon reduction
- Transport is a moderate but growing contributor to global climate change emissions (CCE)
 - but a major (growing) contributor to EU CCE
- Technological solutions offer some potential for improvement, but are alone insufficient
- Behaviour change solutions are necessary, but there are major structural barriers

Collective mobility offers a more realistic carbon reduction strategy

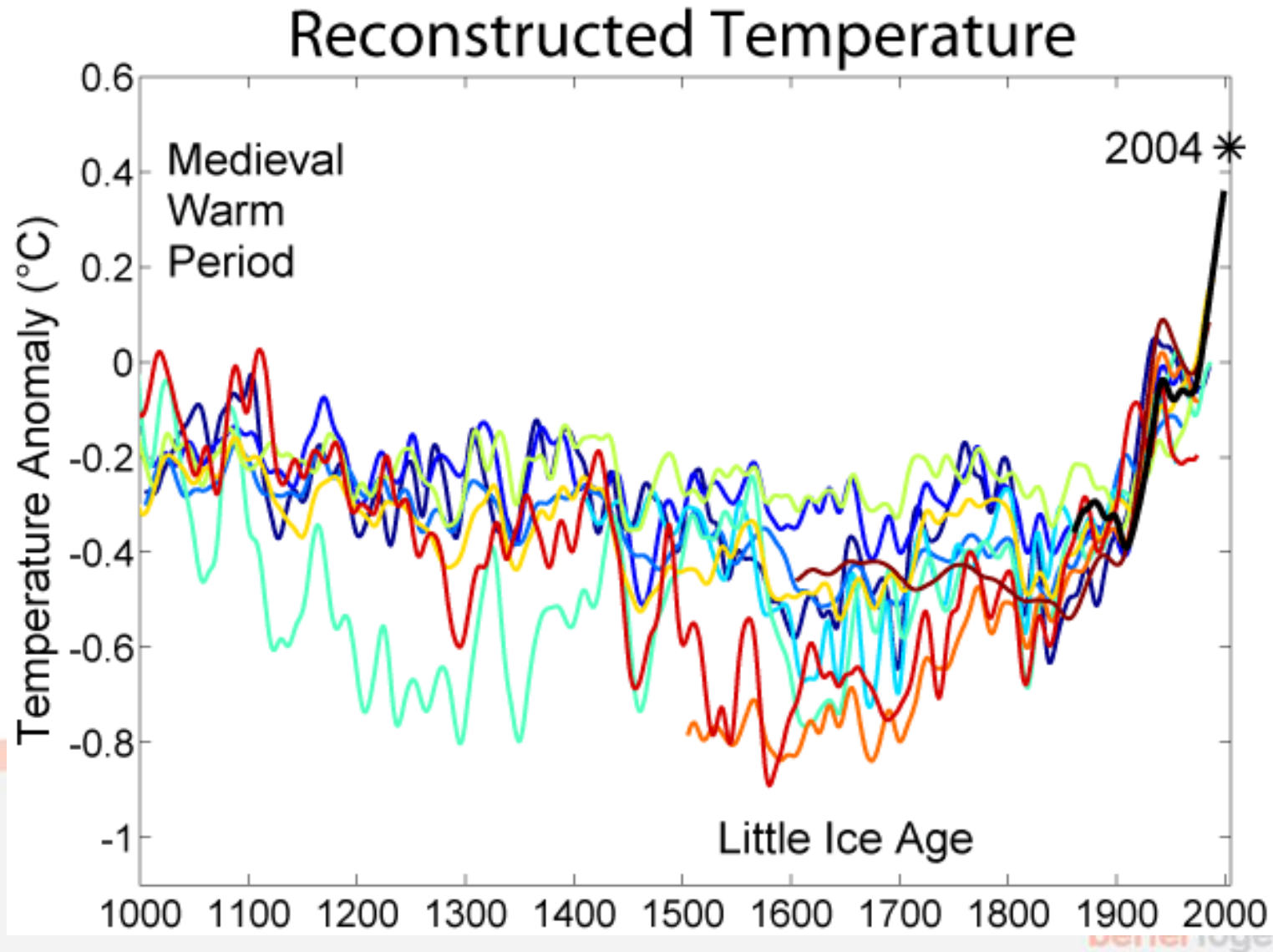
- Flexible, responsive, efficient
- Works with lifestyles not against them
- Peer-to-peer as well as public/private to individual

Europe needs solutions more like this?

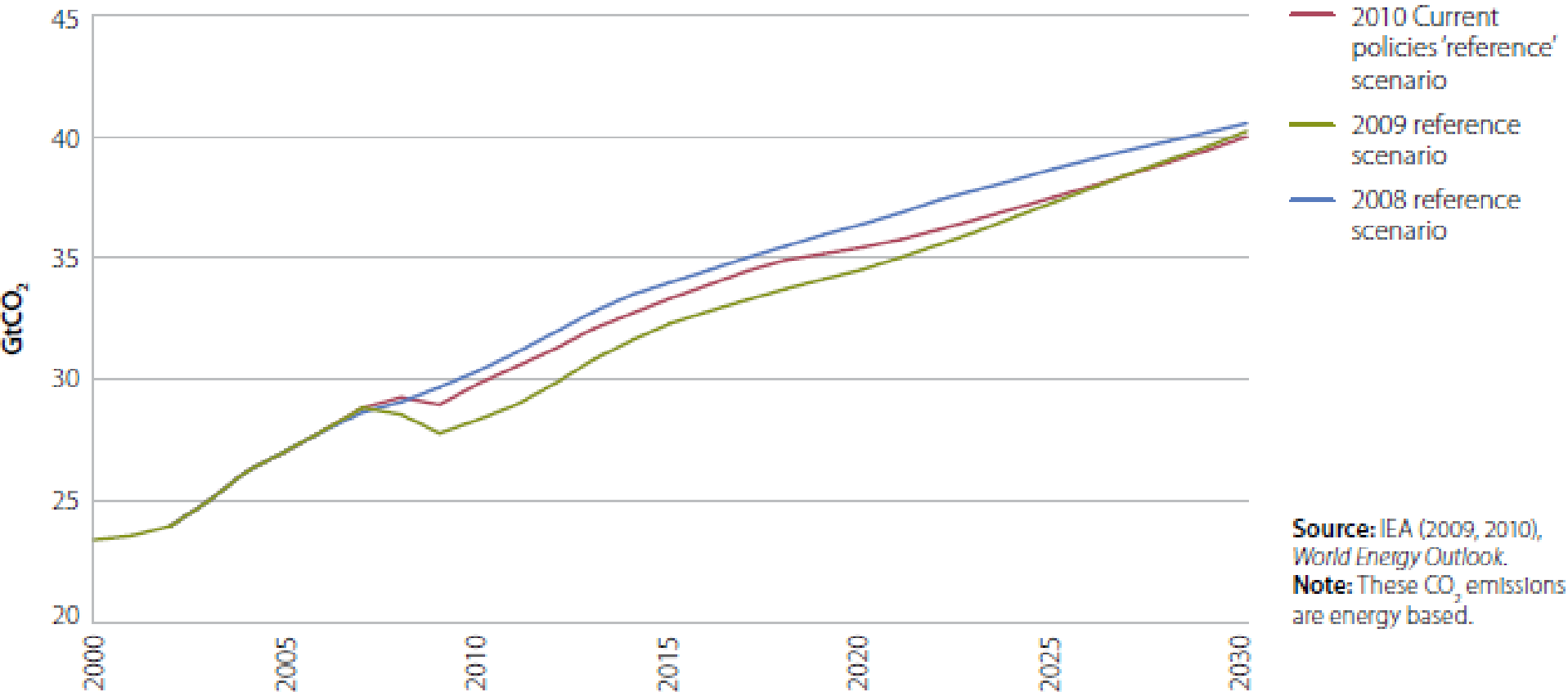


1. CLIMATE CHANGE CONTEXT

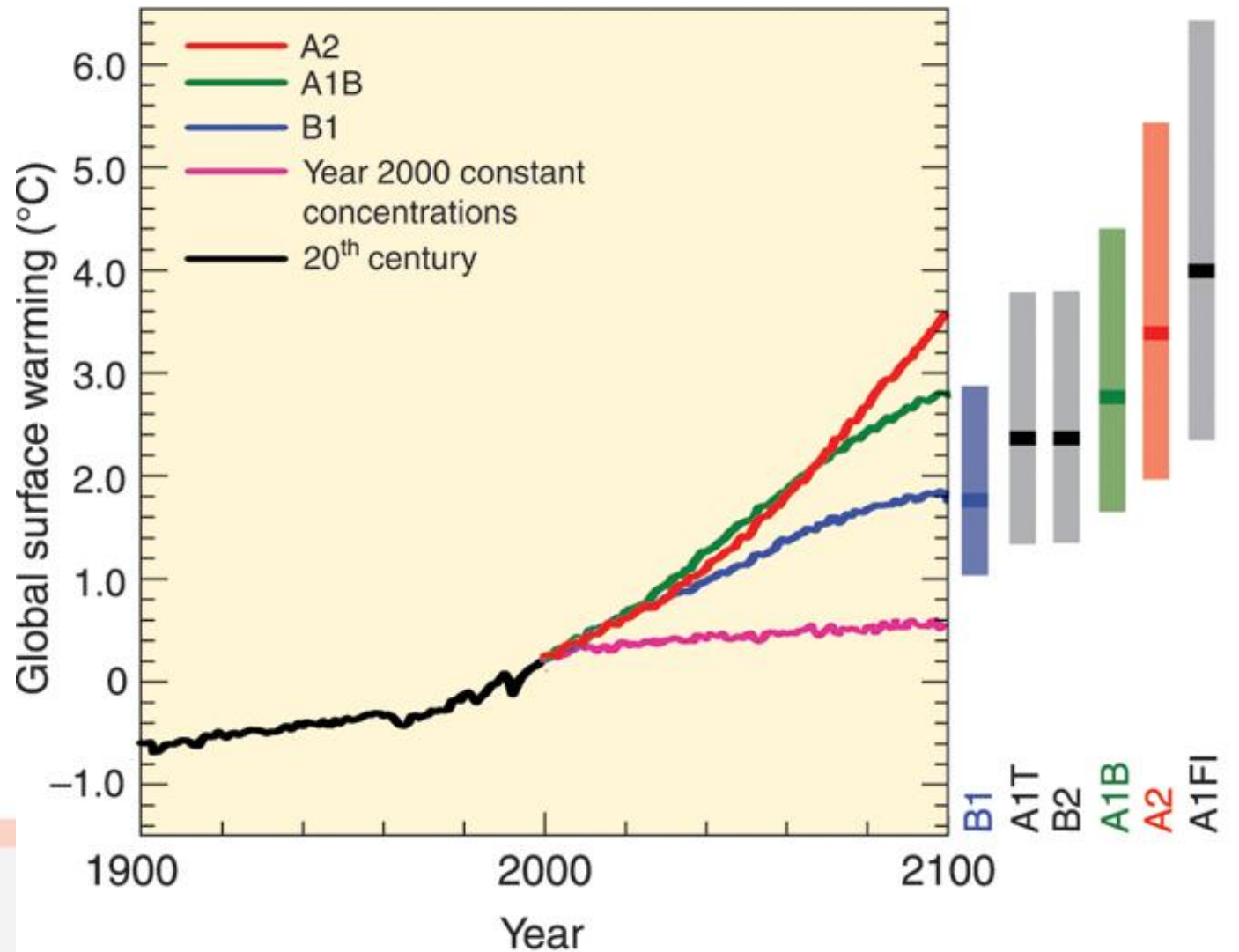
1°C in 20th C and accelerating...



75% increase in annual emissions by 2030?

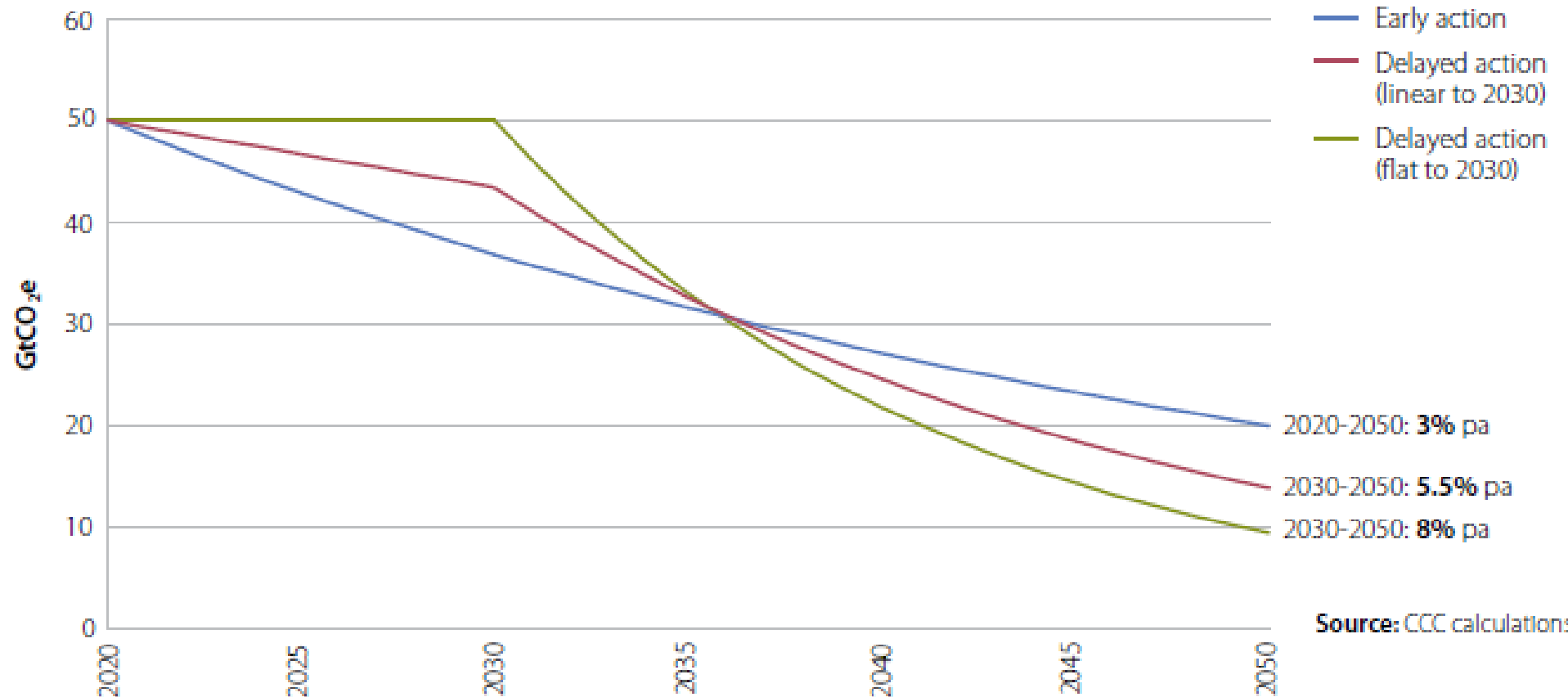


Predictions of further warming...



Copenhagen Accord 2009

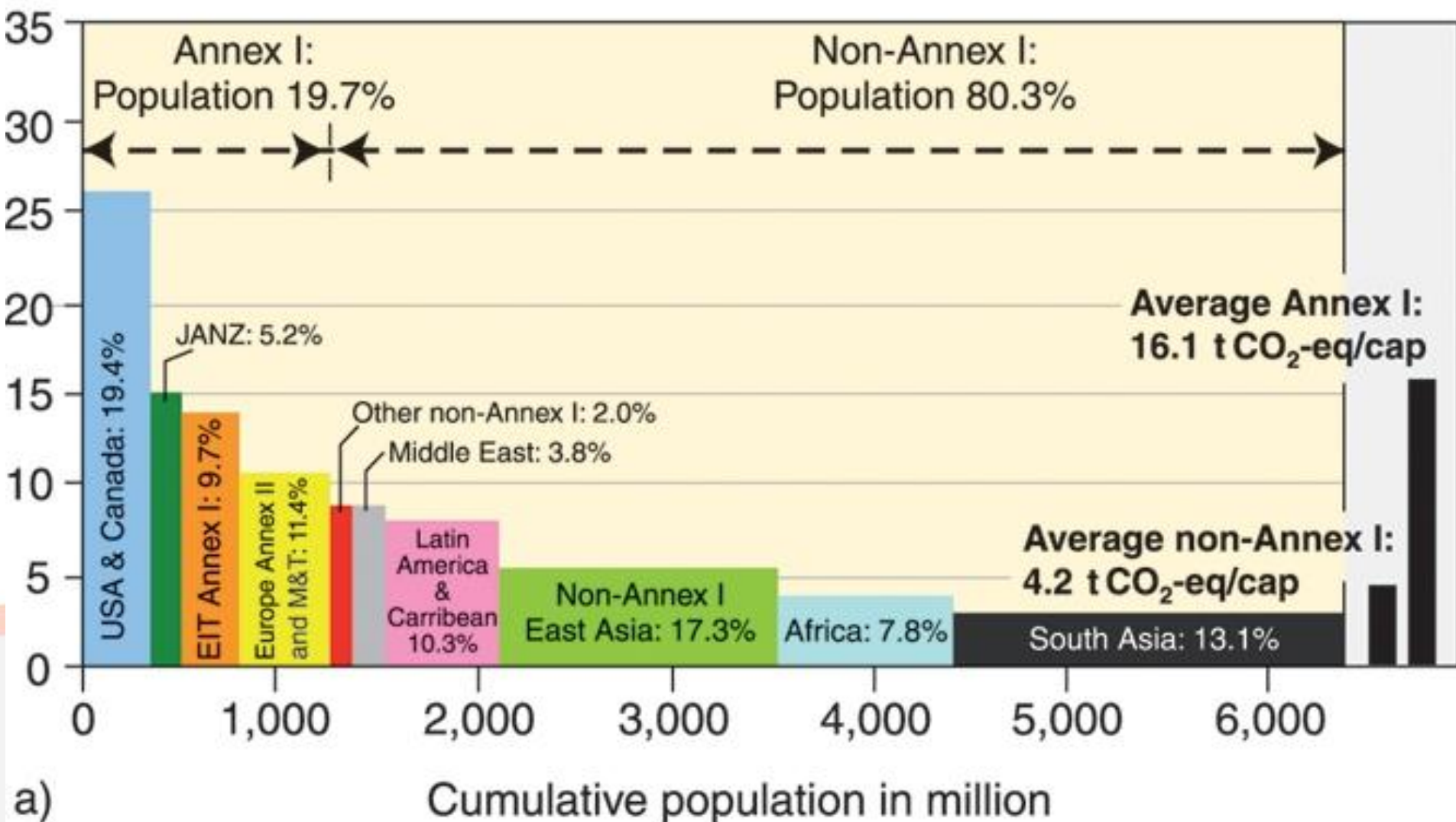
- Constrain increase to 2°C to avoid worst consequences
- Early action will make task easier!



Emissions per capita by major trading areas

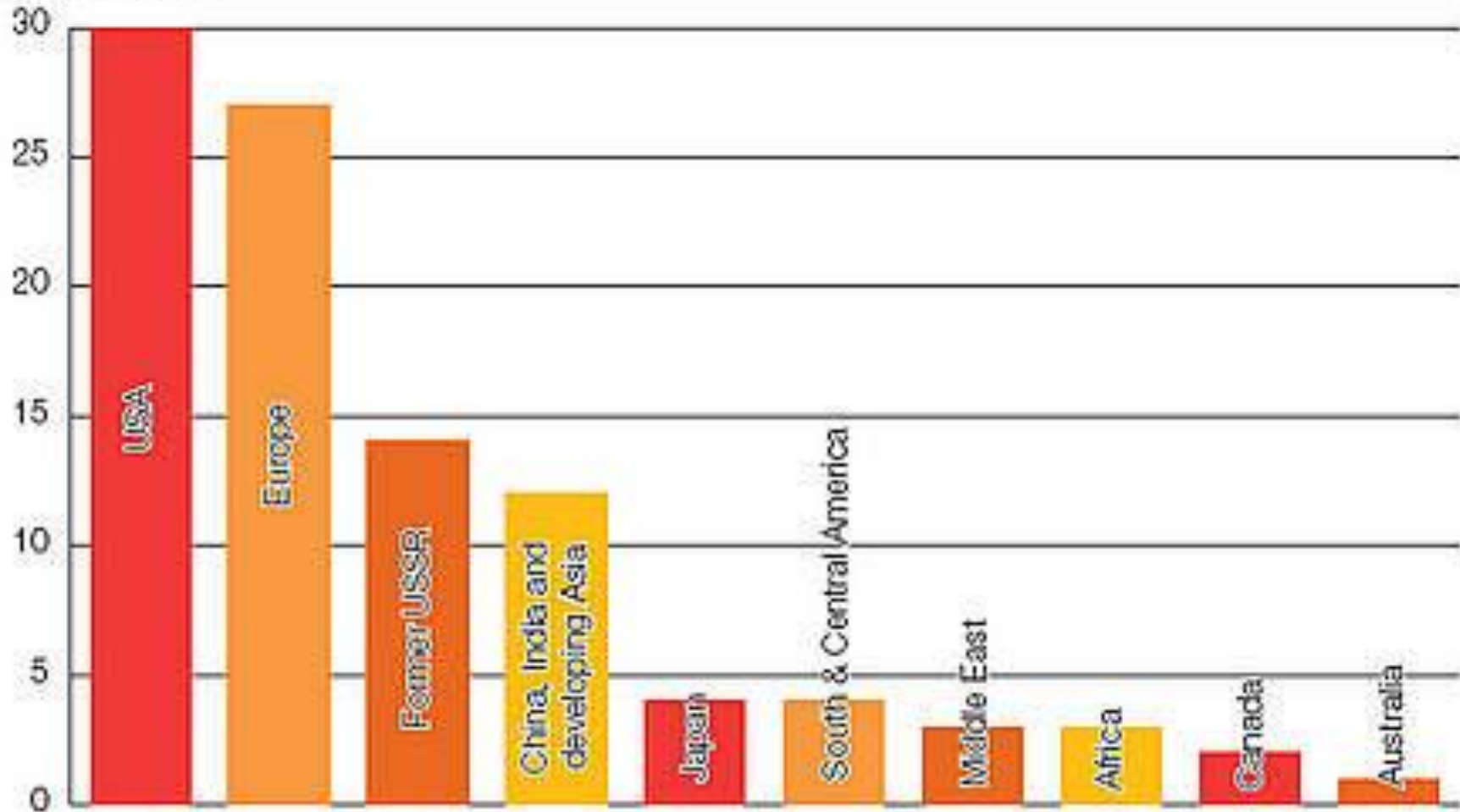
t CO₂-eq/cap

IPPC 4th Assessment Report Fig. 2.2



Historic responsibilities

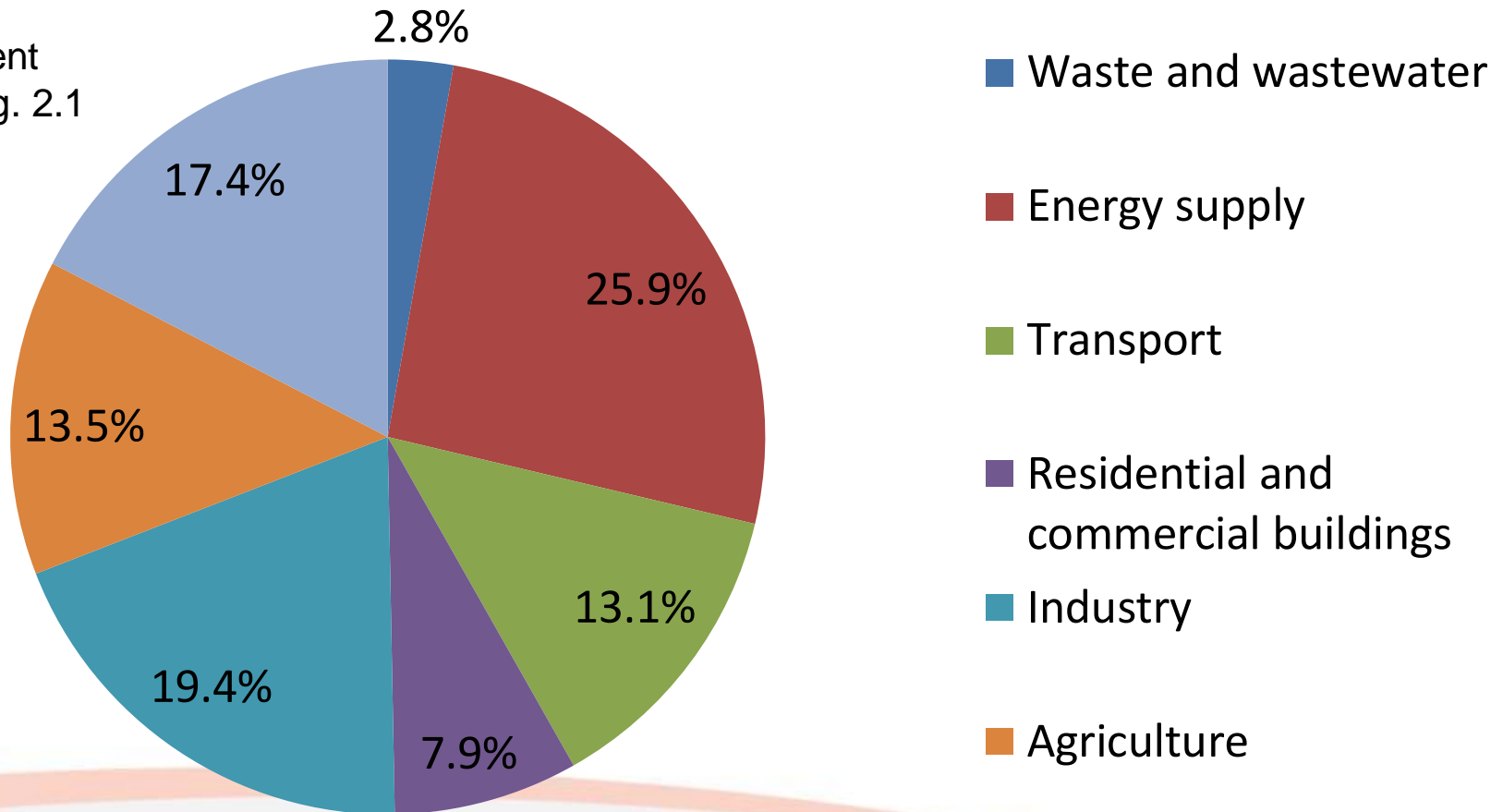
Historic carbon emissions from fossil fuel burning, 1900–1999
(% of total)



Source: Based on Lenton/National Academy of Sciences

Share of sectors in anthropogenic CCEs in 2004 (CO₂-eq)

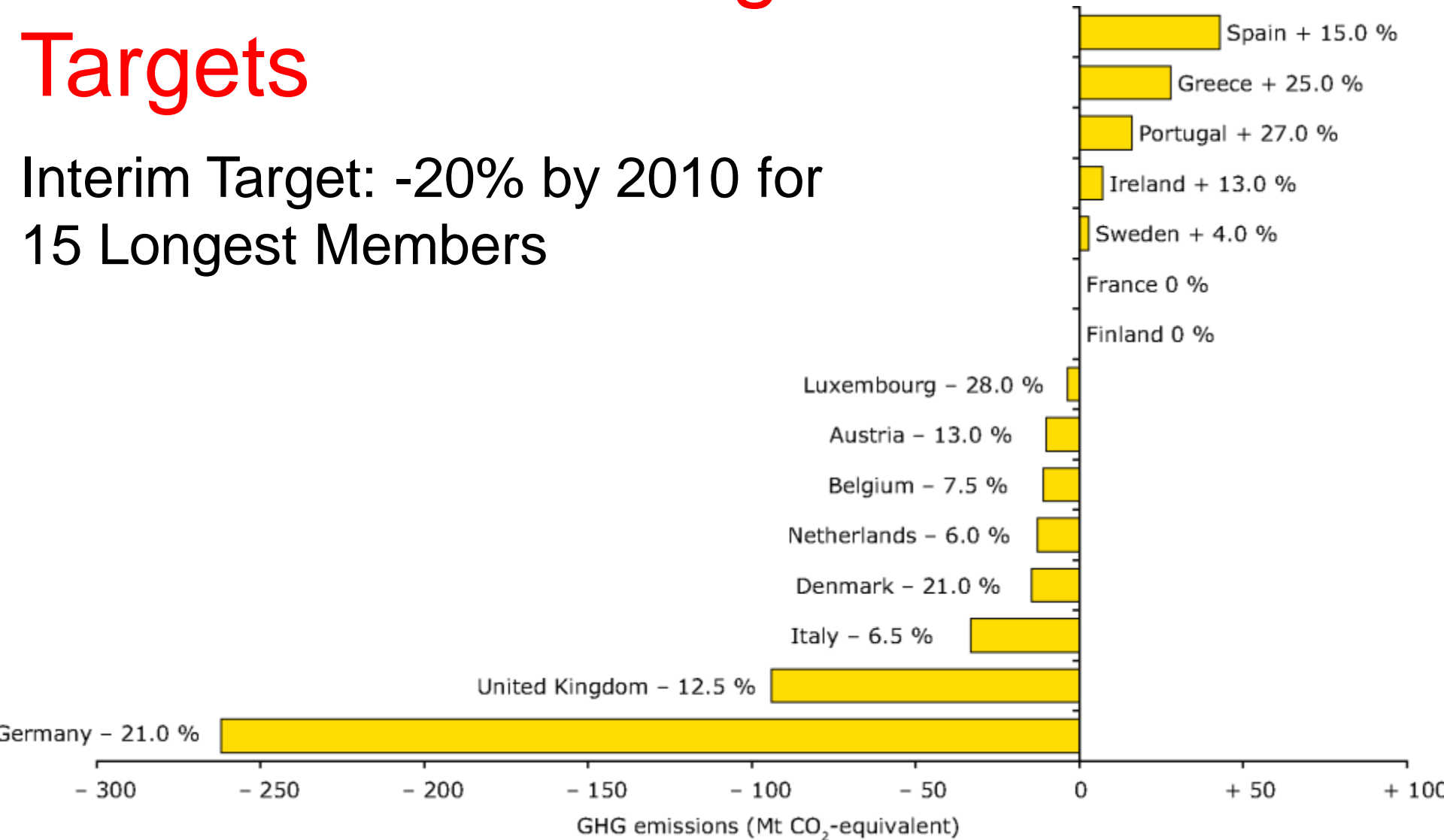
IPPC 4th
Assessment
Report Fig. 2.1



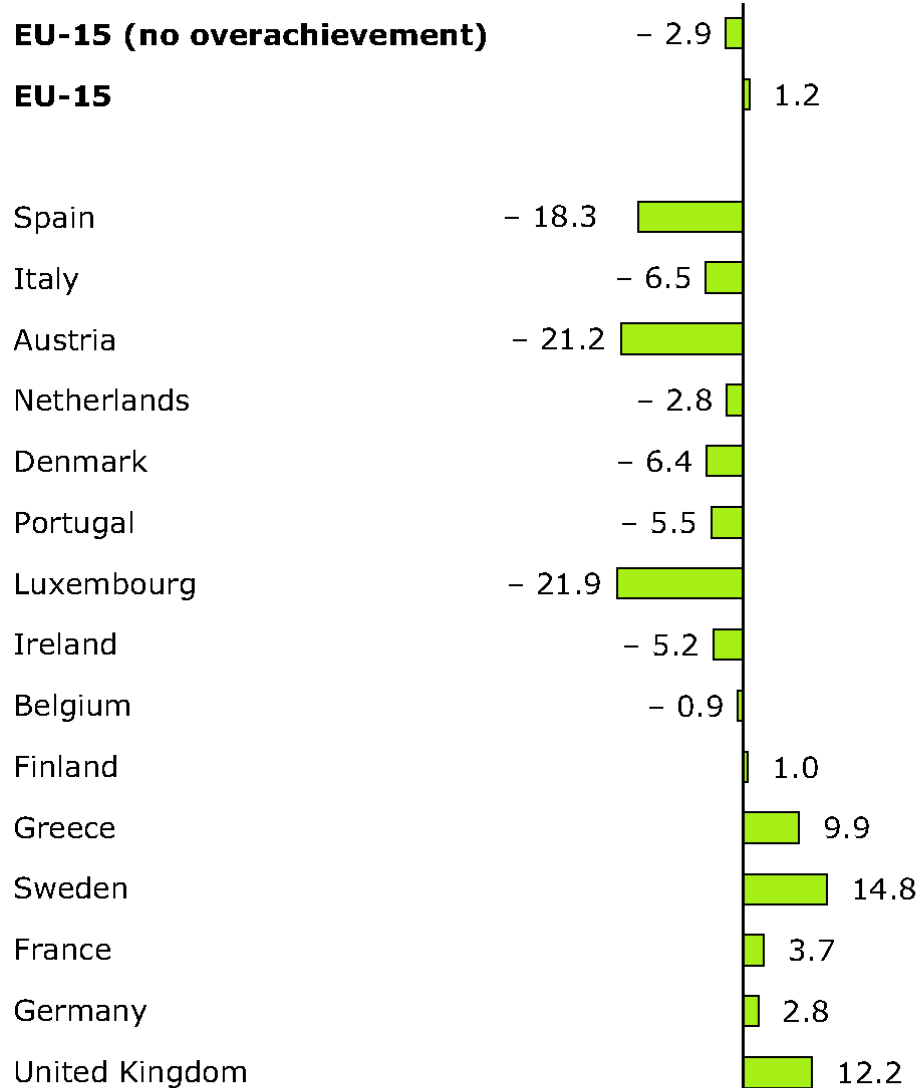
“...largest growth in GHG emissions 1970–2004 from energy supply, **transport** and industry...”

EU Burden Sharing Targets

Interim Target: -20% by 2010 for 15 Longest Members

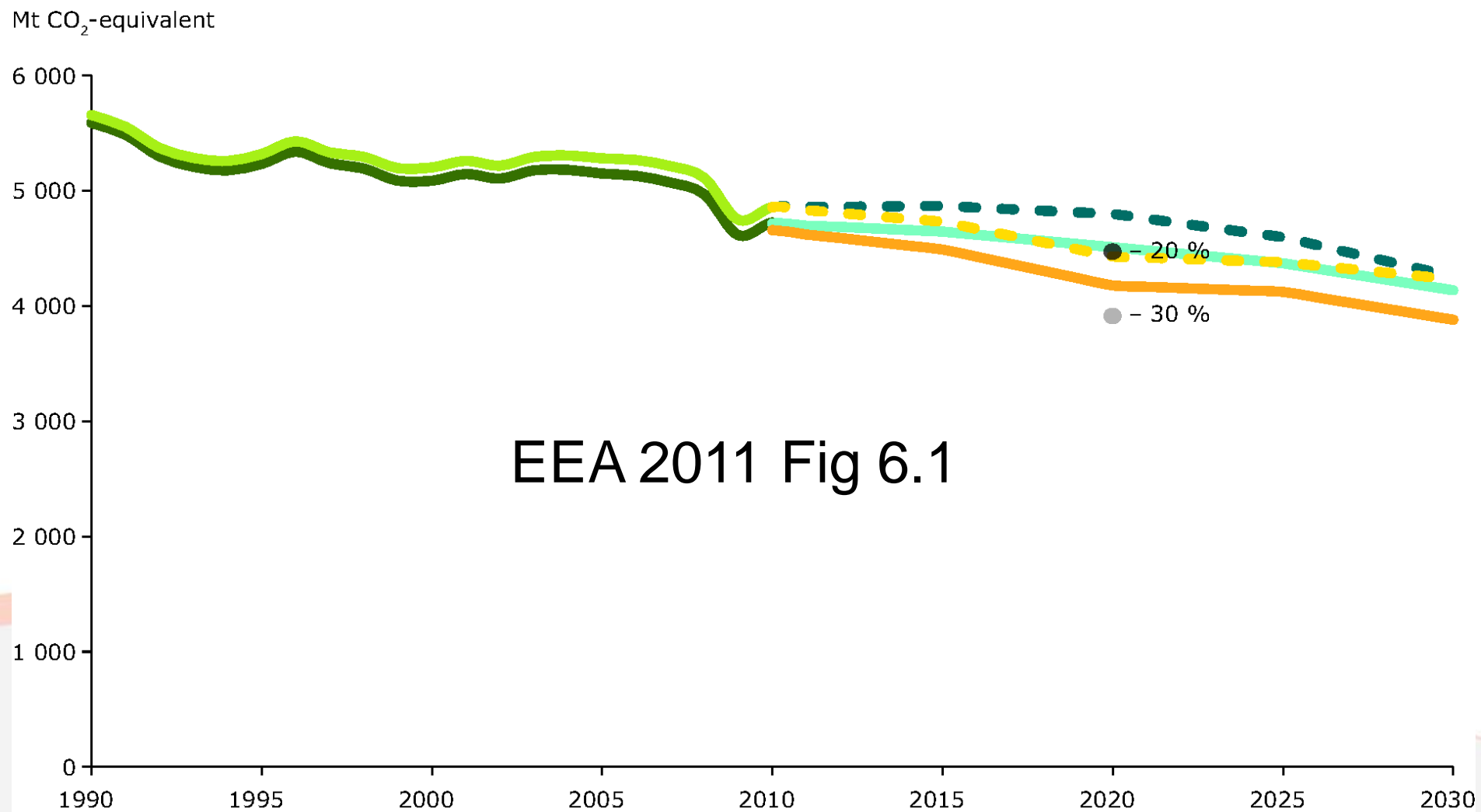


Performance Against Interim Targets EU15



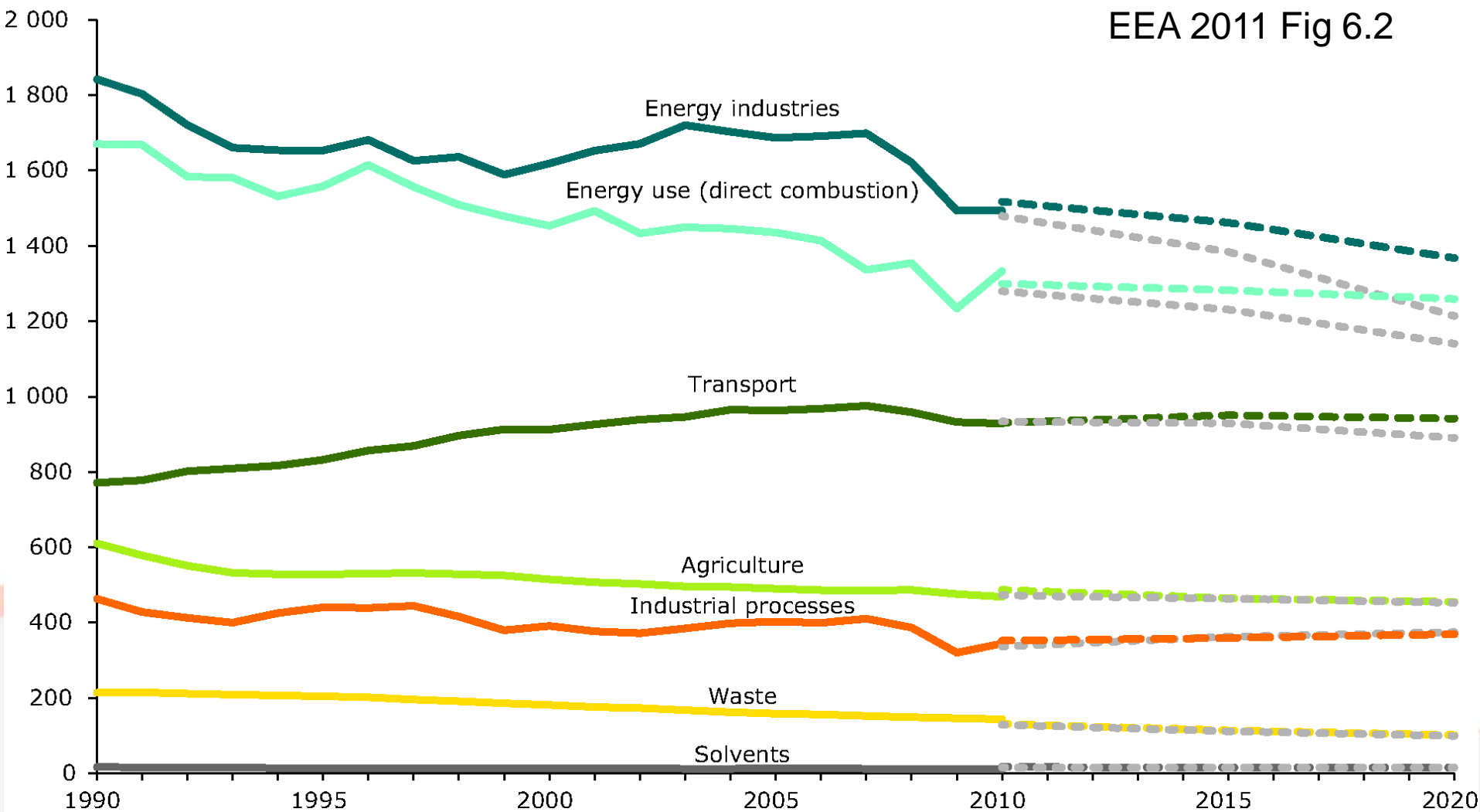
European
Environment
Agency, 2011
Fig 3.3

Overall EU Emissions Trends

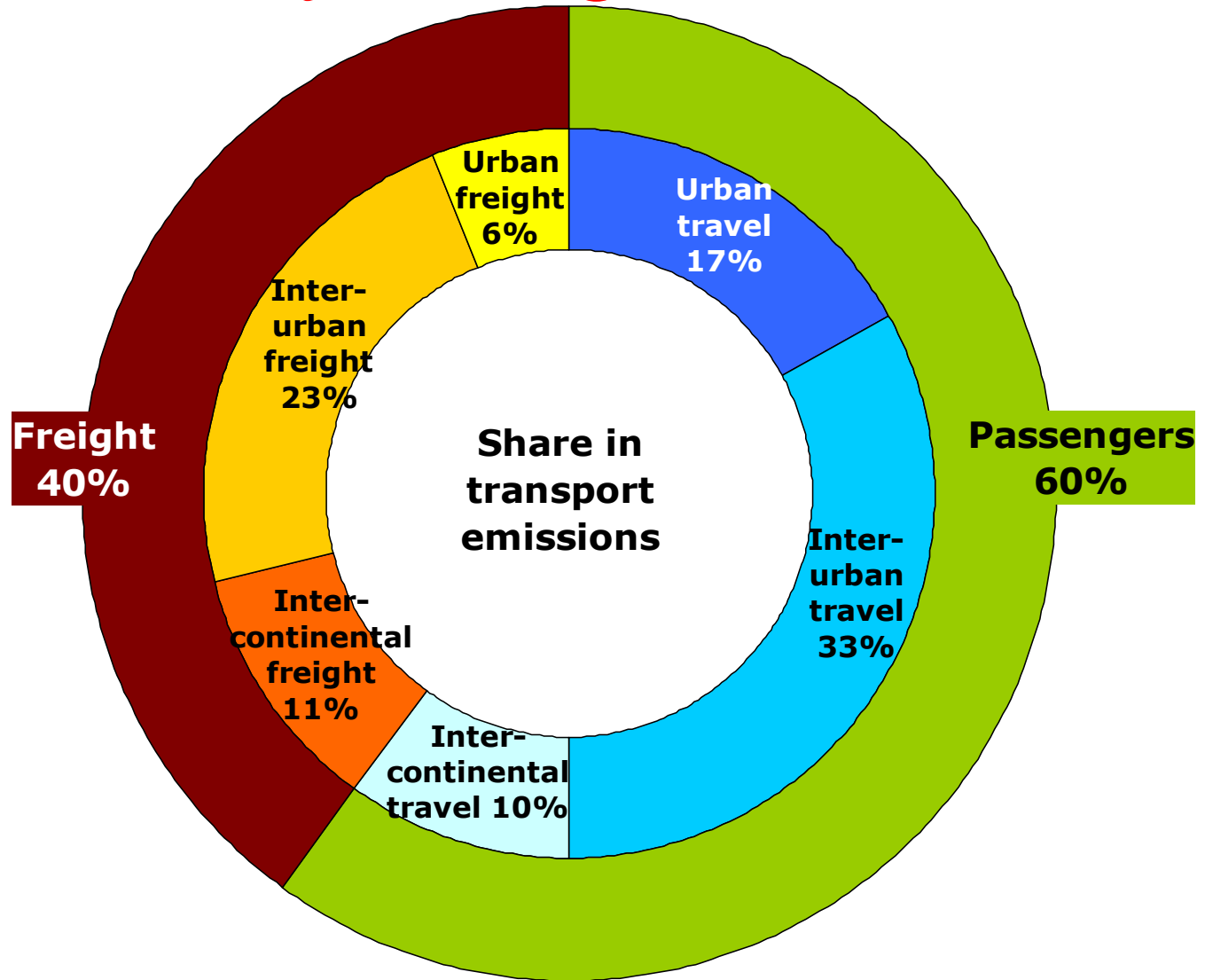


Trends by Economic Sector

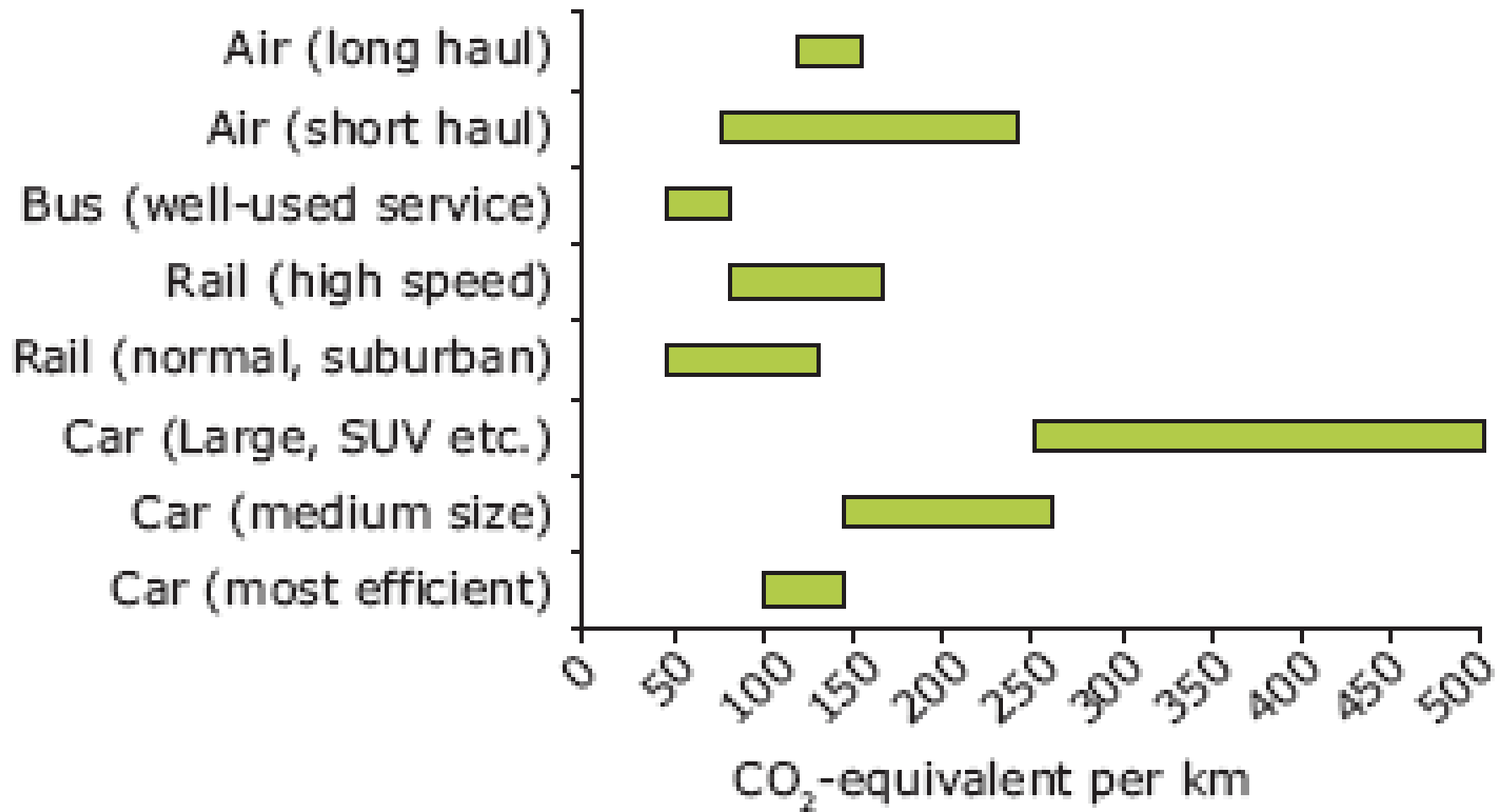
Mt CO₂-equivalent



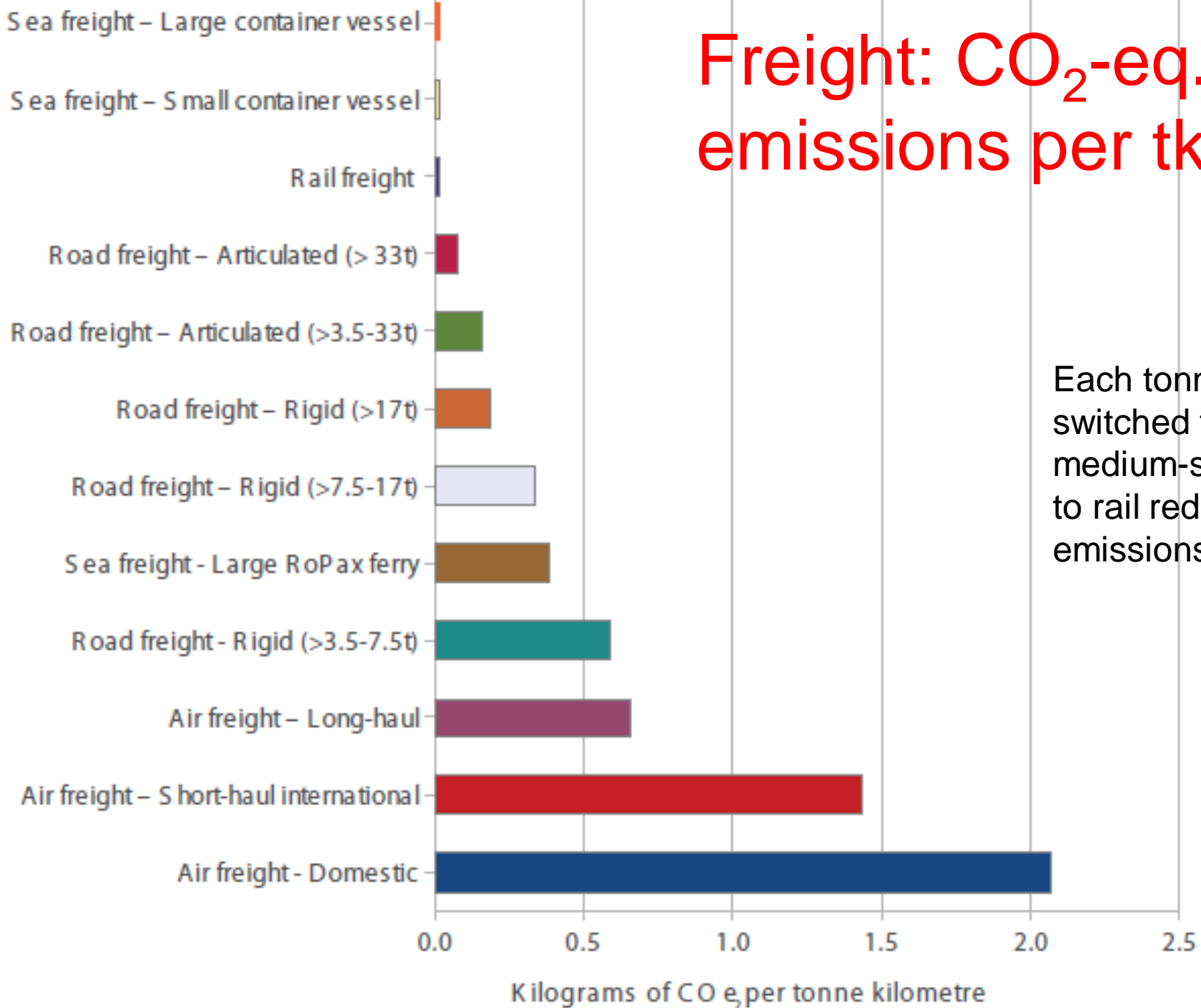
EU Transport CO₂ Emissions: All Modes by Range



Climate Change Emissions By Mode of Transport



Freight: CO₂-eq. emissions per tkm



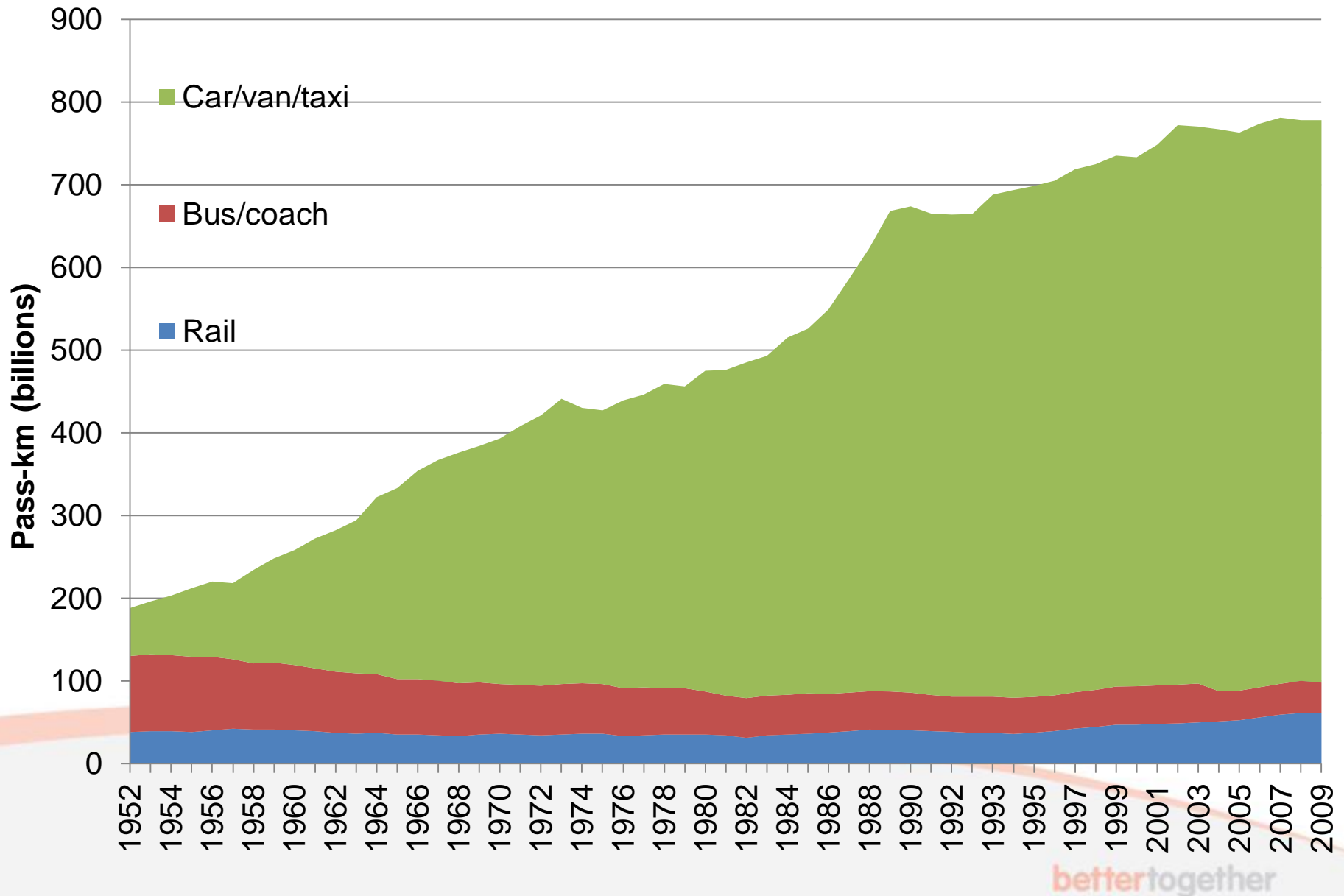
Each tonne-km switched from medium-size lorry to rail reduces emissions by 87%

Climate Change & Transport: Key Points

- Only sector in most EU states where emissions are still increasing
 - Freight and passenger travel
 - Medium-range journeys have the largest absolute contribution
 - Some transport modes very carbon intensive
- Hardest area for politicians to act
 - Limited technical solutions
 - Public resistant to behaviour change

2. STRUCTURAL PROBLEMS IN THE TRANSPORT SECTOR

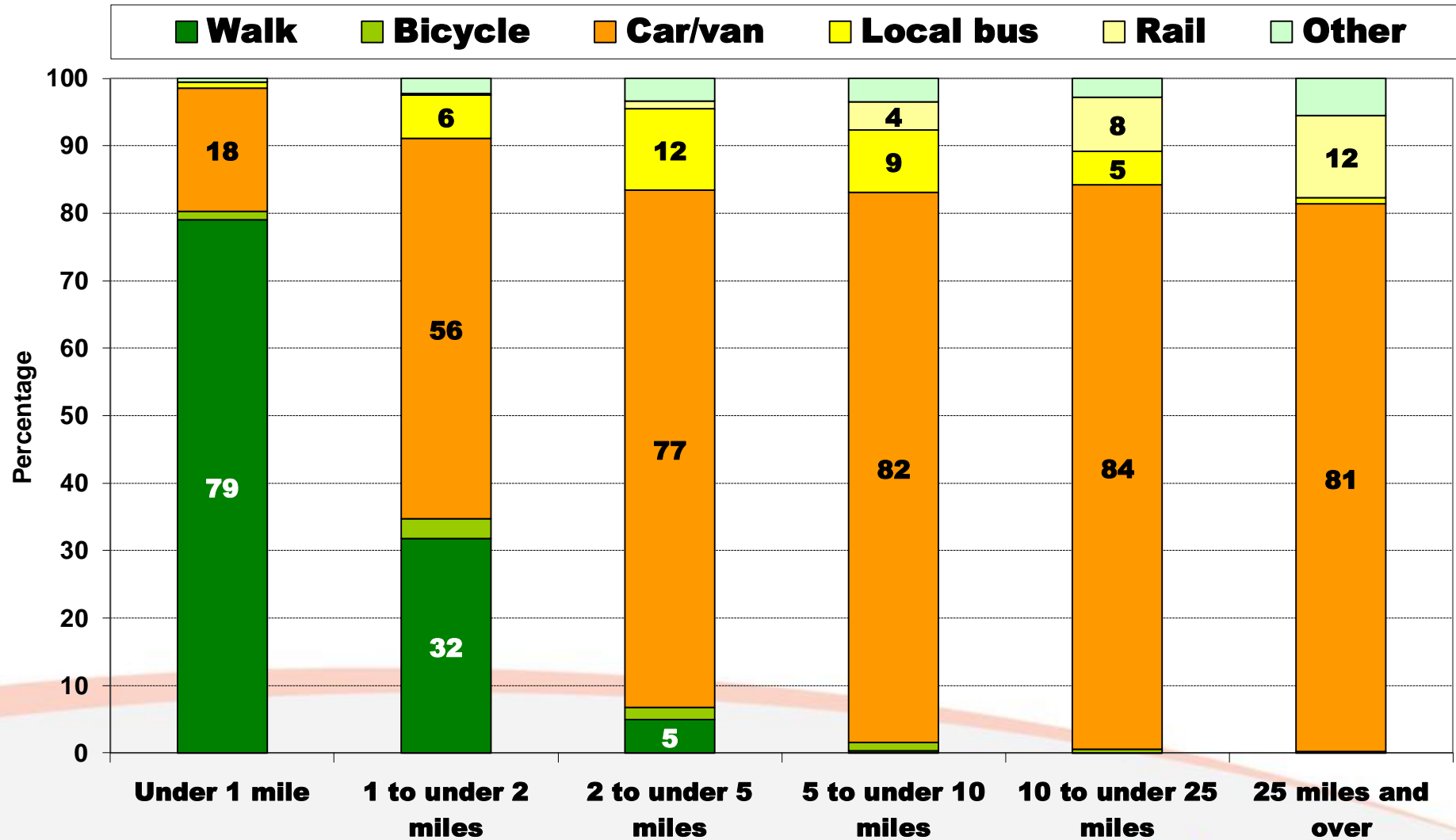
Domination of Private Motor Transport (UK)



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Data: Department for Transport (2010) Transport Statistics Great Britain. Table 1.1

Trip Length & Use of Different Travel Modes



DfT (2010) Trips by length and main mode: Britain, 2009

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Private Car as Dominant Regime

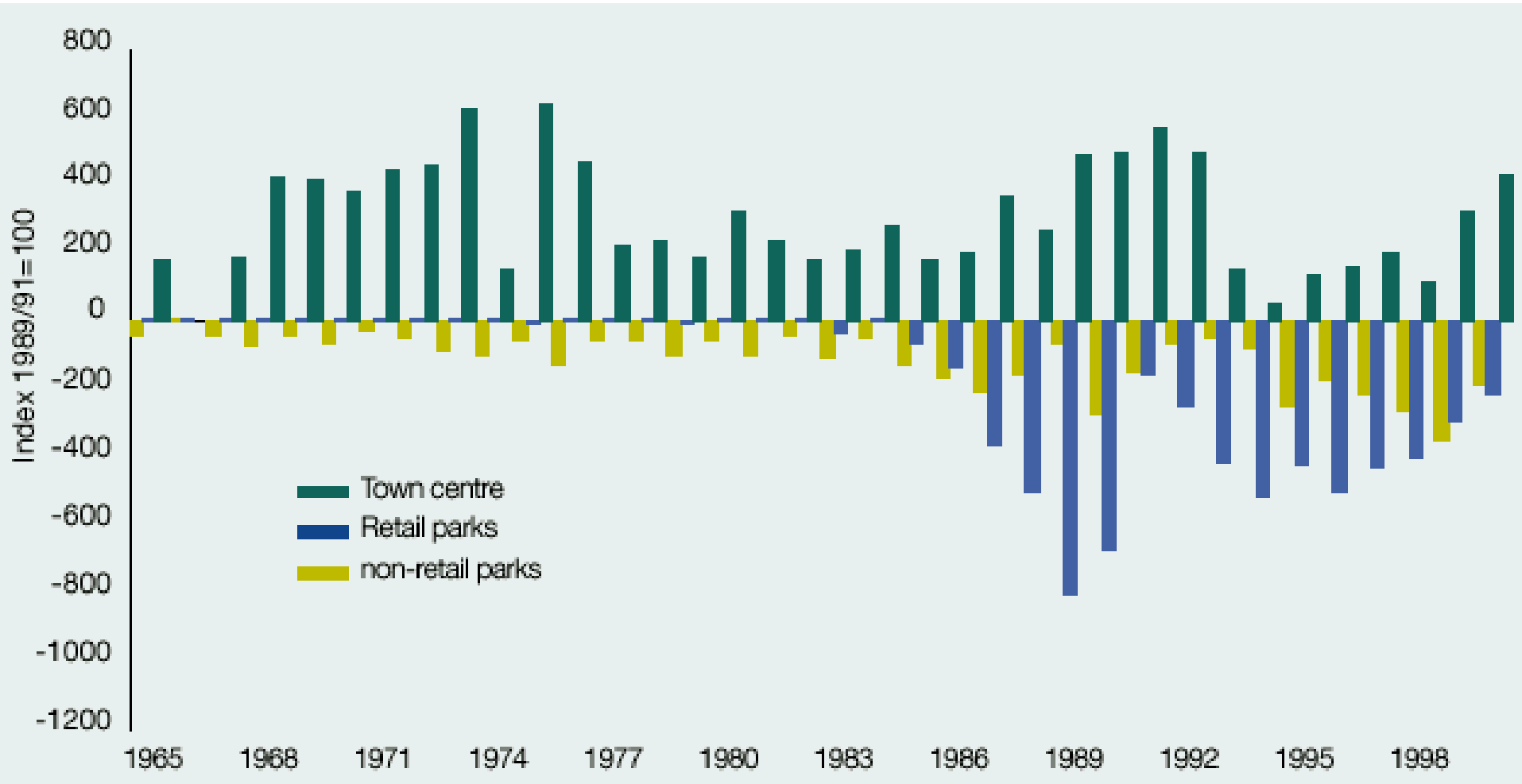
- Systems of production and consumption organised around the car
- social norms/expectations of the majority relate to the car



Effect of suburban design on travel demand



Dispersed UK Retail Development from 1979



Source: DfT (2003) Managing Our Roads p14

Car-oriented development signals
that car availability is expected



Public Transport as a 'Secondary Regime'

- Niches which are attractive to those with a car available and integrate with the car regime
- Niches which serve those without access to a car and are parallel to the car regime

Park and Ride: a 'Niche' of public transport acceptable to car-oriented citizens

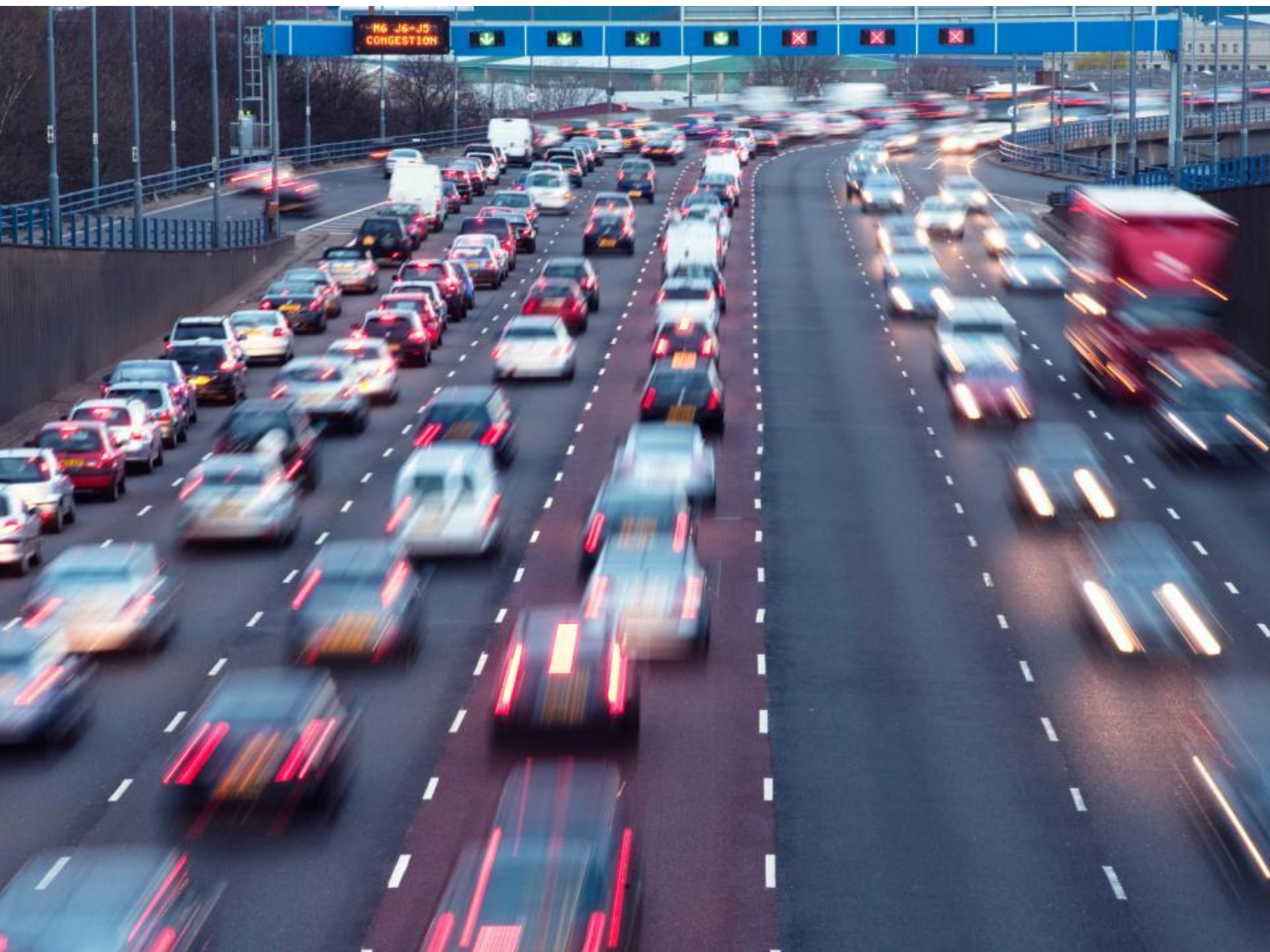


Car as Status Symbol



Advertising Mostly Entirely Unrealistic





M6 J6+J5
CONGESTION



'Pink' Parking Spaces: Example of the Considerate Treatment of the Special Needs of Motorists



Cycle planning as an afterthought



Car Dependence: Key Points

- Car began as providing modest advantage
 - luxury not necessity
- In a growing number of societies now an essential to reach basic necessities
- Where destinations are available nearby, many people choose alternatives to cars
- Urban forms which rely on car availability make people resistant to change

3. PARADIGM SOLUTIONS: 1 NEW TECHNOLOGIES

Diesel-Electric Hybrid Bus: 35% fuel saving



Hydrogen Fuel Cell Hybrid 'in fashion again... but FAR from commercial application



E-cars: emerging niche in regime



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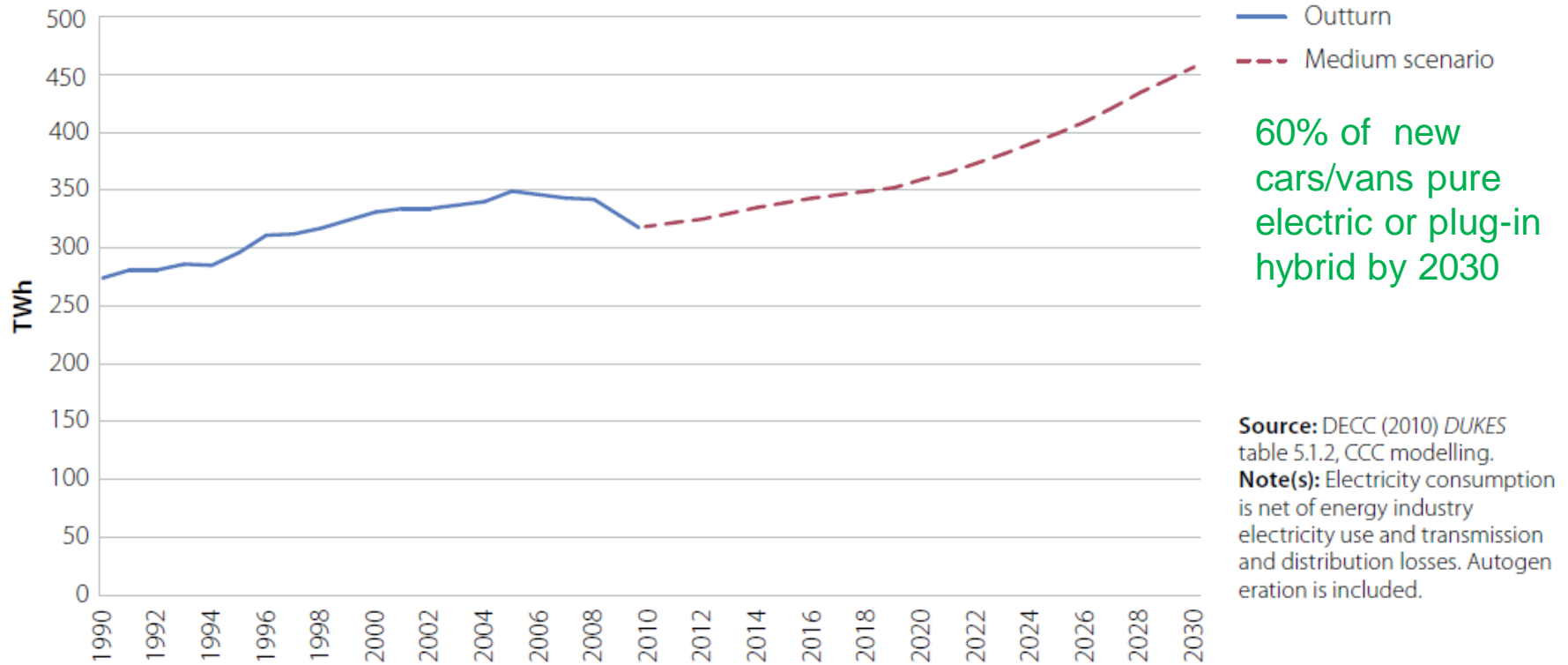
Electric cars: the unresolved questions and issues

- Source of carbon-neutral electricity?
- Distribution capacity?
- Availability of rare raw materials?
- Accommodating recharging capacity
- User acceptance of vehicle costs and characteristics
- Impact on tax revenues
- Potential to restart traffic growth

How to recharge all
these cars?



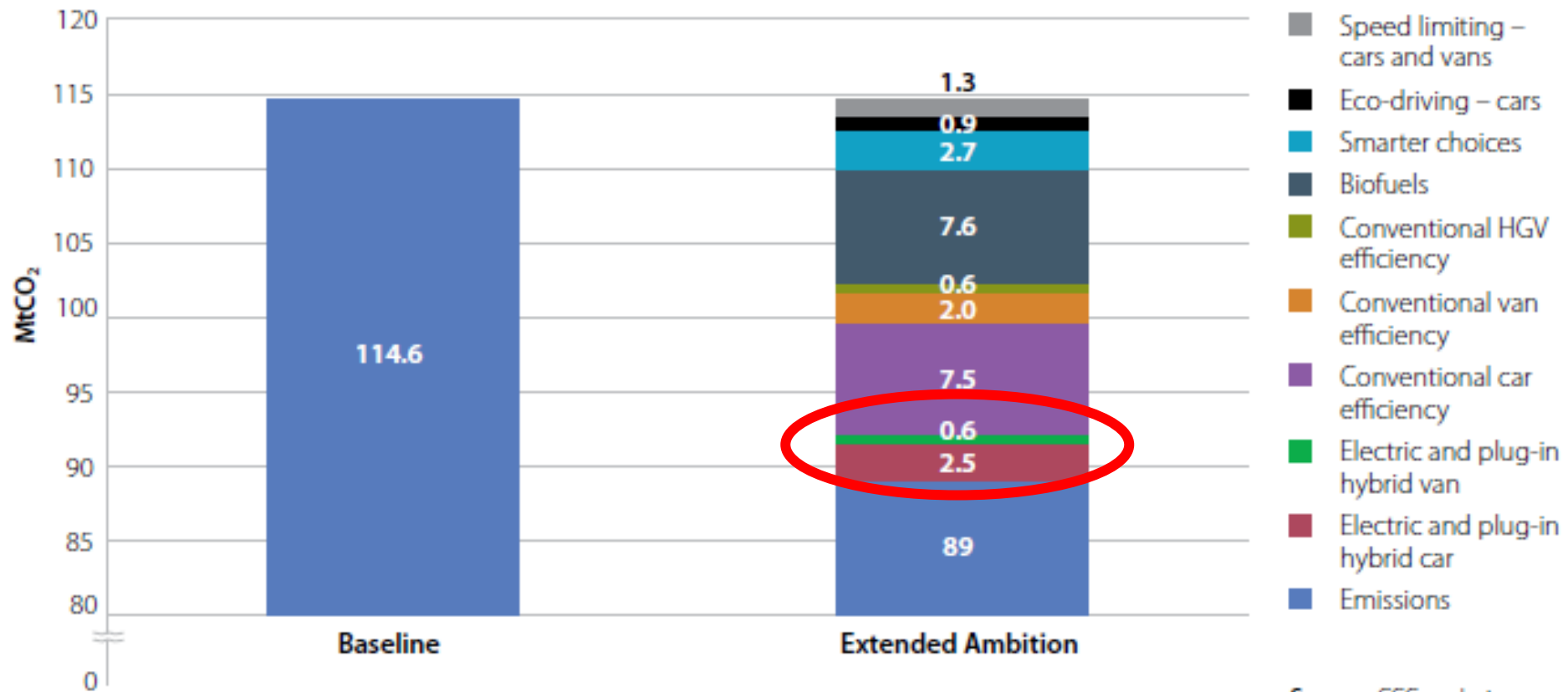
Figure 6.17: Electricity demand (1990-2030)



12% increase due to electric vehicles

Too Little Too Late?

Ecars worth -3.1% road transport emissions reduction by 2020



Source: CCC analysts.

4. PARADIGM SOLUTIONS: 2 BEHAVIOUR CHANGE

UK HS Rail Plans...



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A map of the United Kingdom showing the planned routes for High Speed Rail. A red line represents the High Speed 1 (HS1) route, which runs from London to the coast. A black line represents the High Speed 2 (HS2) route, which starts in London, goes to Heathrow Airport, then branches to Birmingham, Manchester, and Leeds. The map includes a legend at the bottom left.

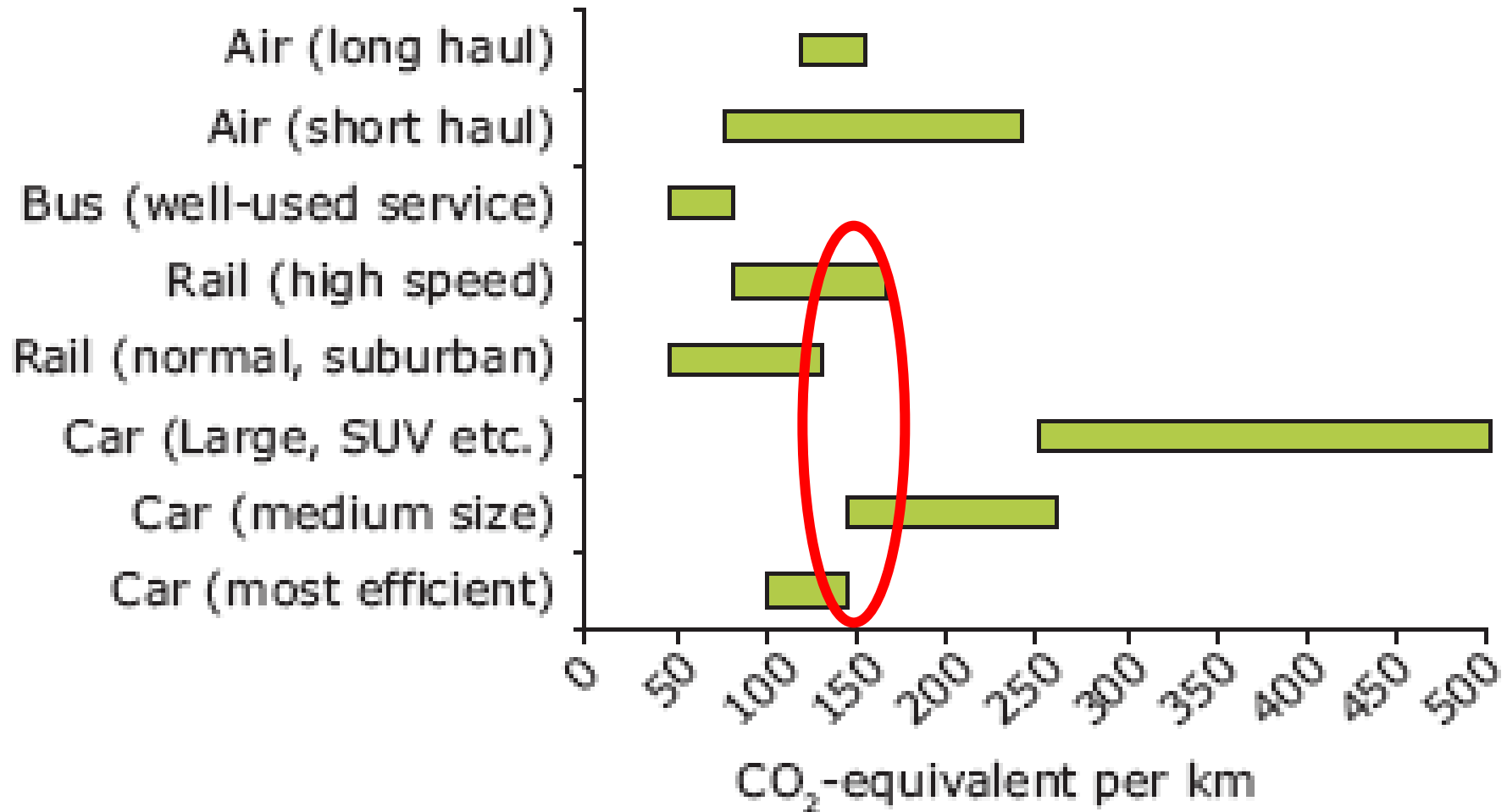
— High Speed 1 (2007)
— High Speed 2 (planned 2025)

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...£37 Billion
INR3145 Billion!

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Climate Change Emissions By Mode of Transport



Time-savings and slots vacated with HSR according to Givoni (2006)

Destination	Time saving (min.)	Daily flights from LHR	% of runway capacity (466,554 atm)	
			Route	Cumulative %
Manchester	63	15	2.3%	2.3%
Leeds	60	4	0.6%	3.0%
Brussels	54	13	2.0%	5.0%
Newcastle	38	4	0.6%	5.6%
Paris	23	27	4.2%	9.8%
Cologne	9	6	0.9%	10.8%
Glasgow	4	18	2.8%	13.6%
Amsterdam	3	23	3.6%	17.2%
Edinburgh	1	16	2.5%	19.7%
Düsseldorf	-1	6	1.2%	20.9%

HSR integration also seen as a means of preserving Heathrow's hub status

Buses in UK are already available to most citizens

- Somewhat expensive but discounts for young and old
- Vehicles physically accessible by most
- 96% households within '13 minutes walk' of a bus stop with an hourly service
 - 85% within 6 mins
 - Even 69% rural households within 6 mins!

And can be improved...

- Conventional bus services
 - 10-15% increase on Bristol 'showcase' routes (but not all trips switched from car)
- Relative advantage for bus services
 - Higher global fuel prices beneficial
- Lower bus fares
 - trips increased by free travel from older citizens (but only a minority switched from car)
- Guided Buses and Bus Rapid Transit

Cambridgeshire Guided Busway



Comprehensive 'Showcase' Approach

- Priority measures
 - Bus lanes
 - Selective Vehicle Detection at traffic controlled junctions
 - Camera enforcement
- Satellite tracking to provide information to:
 - Significant bus stops
 - SMS text and web
- Modern Bus stops
 - Low floor kerbs at stops
- Driver training
- Bus information strategy
 - new formats to public, businesses
 - mailing to households



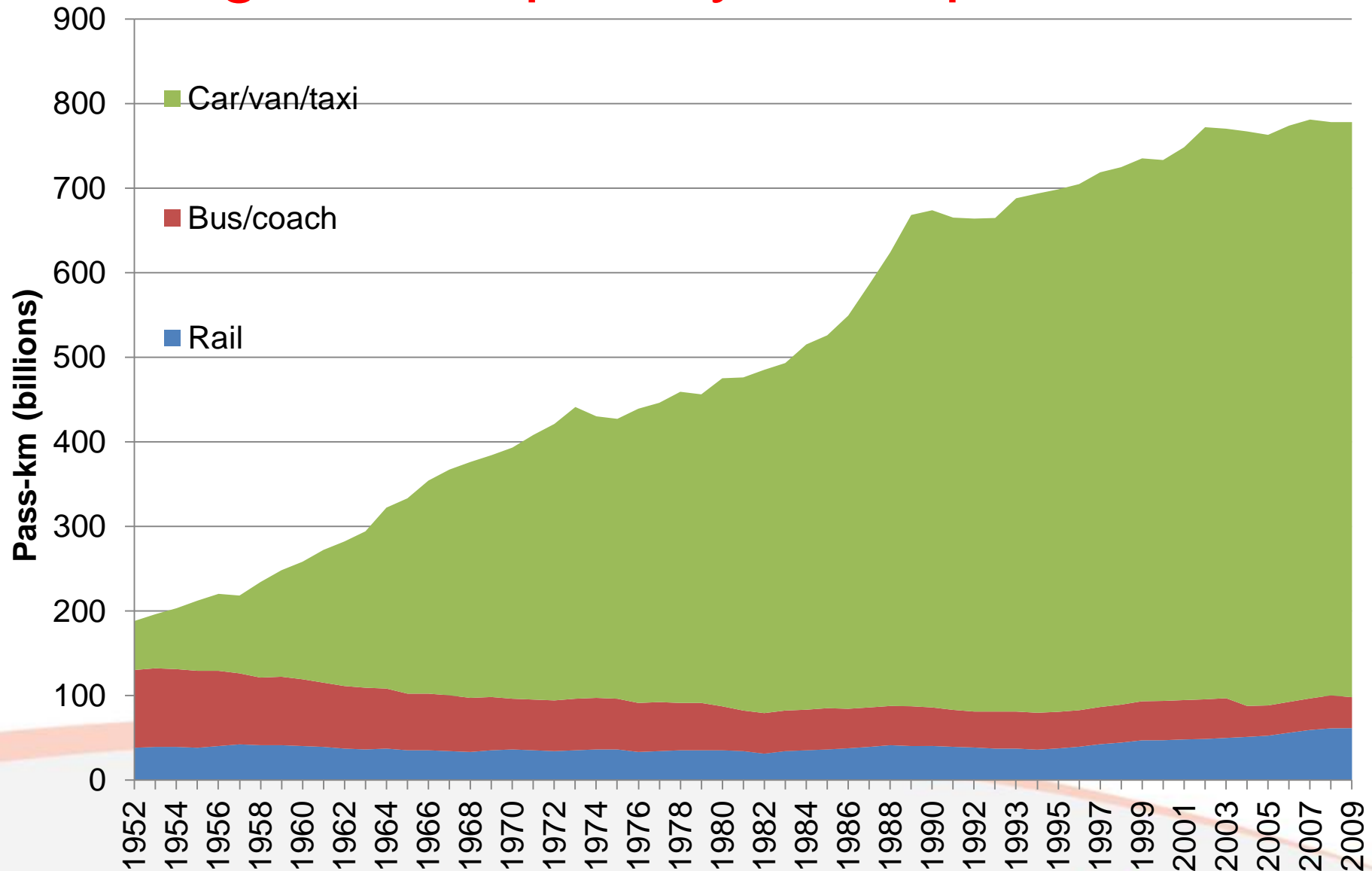
‘Smarter Choices’

- Organisation-based travel plans
 - Focus on travel to work and travel for work
 - 10-30% @ public cost of £2-4 per employee
- School travel plans
 - Target safety to encourage walking/cycling
 - Typical reductions in car use 8-15% (some 20%+)
- Personal travel planning
 - One-to-one ‘counselling’ of travel options
 - 7-15% reductions in car use in larger urban areas?
 - £20 public cost per individual?
- Public transport marketing
 - Information, branding, image-making
 - 1.5-5% increases in bus use @ cost of £60-300k

Bus Services: Important and Useful but Limited Solution

- Proximity of stop does not imply an attractive 24/7 service
- 10% modal shift from car to bus could be equivalent to 170% increase in bus passenger-km
- Hard to attract new passengers from bus unfriendly locations
- Can't happen without substantial subsidy – there is no money!

Passenger Transport by Principal Modes



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Data: Department for Transport (2010) Transport Statistics Great Britain. Table 1.1

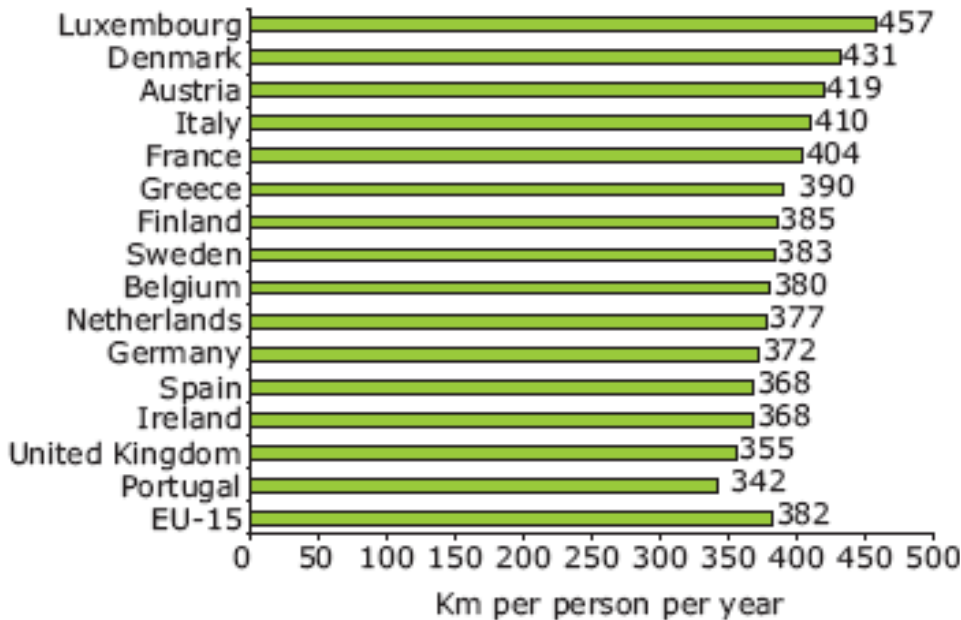
5. COLLECTIVE MOBILITY: MORE REALISTIC SOLUTIONS!

Key constraints for sustainable mobility policy

- Individualism
 - Greater spontaneity in decision-making
- Complexity in travel patterns
 - slow rate of urban redevelopment
- Role of habit and social norms
 - Rising costs of car ownership and use
- Poor public finances
 - High wage and capital costs

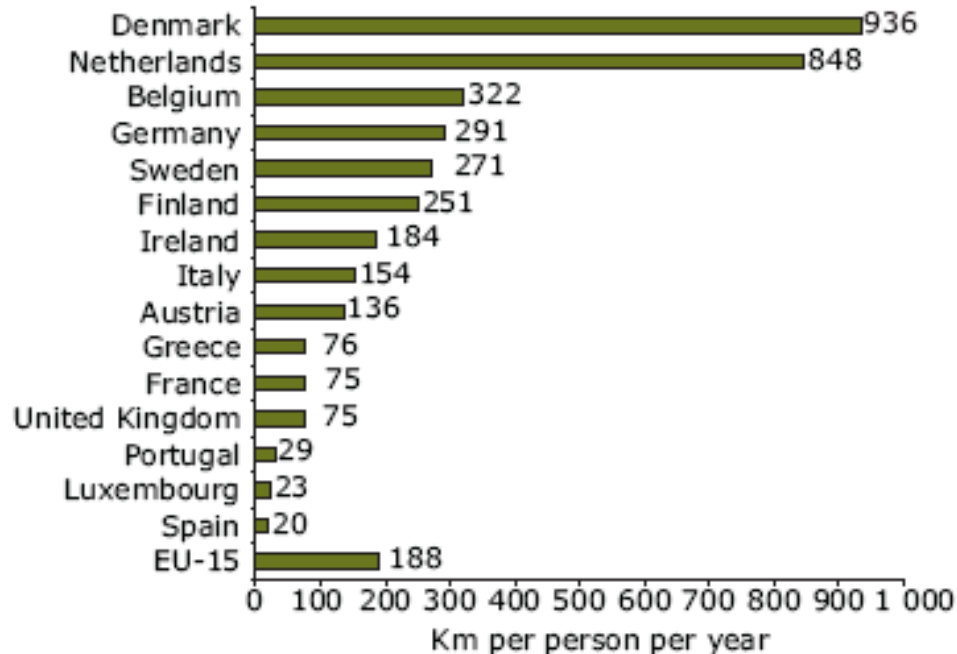
Walking & Cycling: Zero Carbon Modes Which Show Cultural Variation

Walking



Source: Eurostat, 2000.

Cycling



Source: Eurostat, 2000.

Public bikes/bike sharing



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New modes of 'private' car use

- Time options: by day/part-day/hour/trip
- Market options: commercial, car sharing, peer-to-peer (also for parking)
- Spatial options: return to origin/leave at destination



Diversification of trip sharing modes

- Same-destination, same-social group (e.g. Employer-based van-pooling)
- Route based (stimulated by HOV/HOT lanes or toll discounts)
- Trip 'dating' (prearranged between strangers via web intermediary)
- Hitch-hiking (conventional, e-thumbng)
- Reciprocal vs remunerated vs donated

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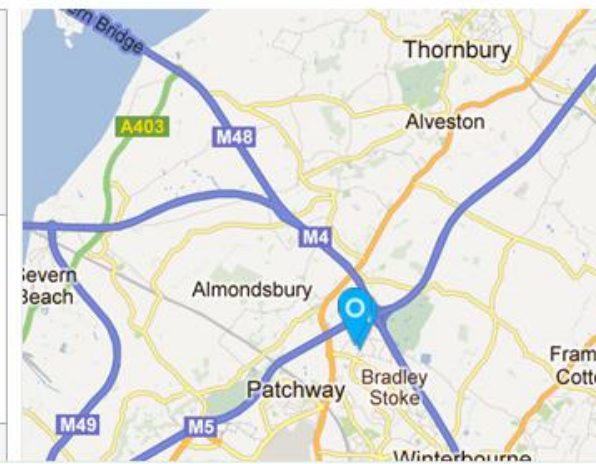
Kia Sedona Ls A
★★★★★ (2)
Avg response time: ~ 5 hours
1 - 2 miles

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ULTRA PRT @ Heathrow T5



Conclusion

- EU committed to lead on carbon reduction
 - UK committed to 80% reduction in carbon emissions by 2050
- Transport remains the most problematic sector
 - Substitute technologies offer a necessary but limited contribution
 - Behaviour change is too difficult with current travel options
- Collective mobility solutions are needed to make current travel patterns more efficient alongside behaviour change and technical fix

Thank you!

Questions?

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