


# Peak Oil and the Security of Energy Supplies



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**Transport Policy Board**

**Institution of Highways and Transportation**



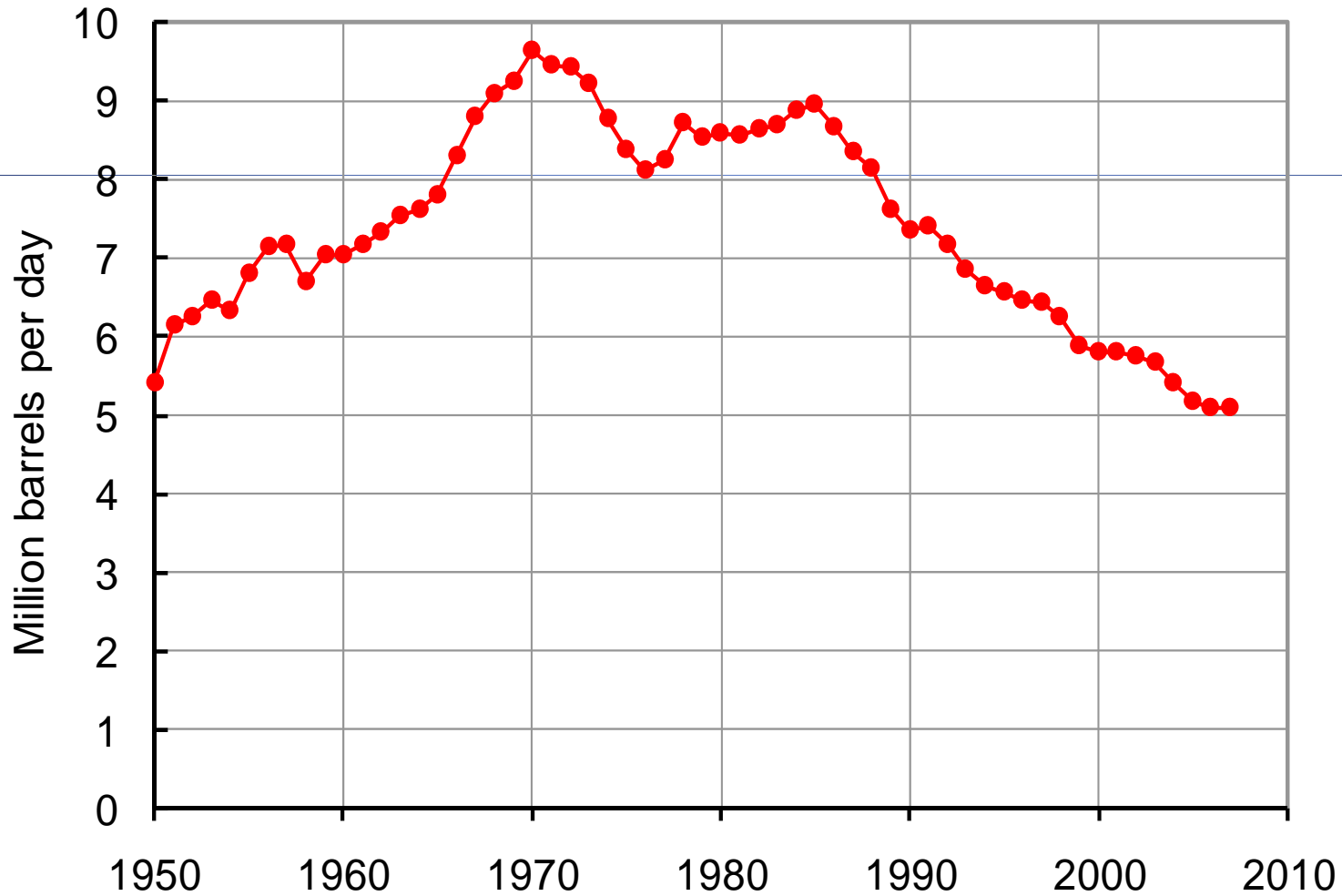
**The prosperity of the 20th century  
was mainly built on a plentiful  
supply of low cost oil.**

# World Oil Production

- Production of any material from finite resources tends to follow a bell-shaped curve.
- Production rises until about half the exploitable material has been extracted, then falls.

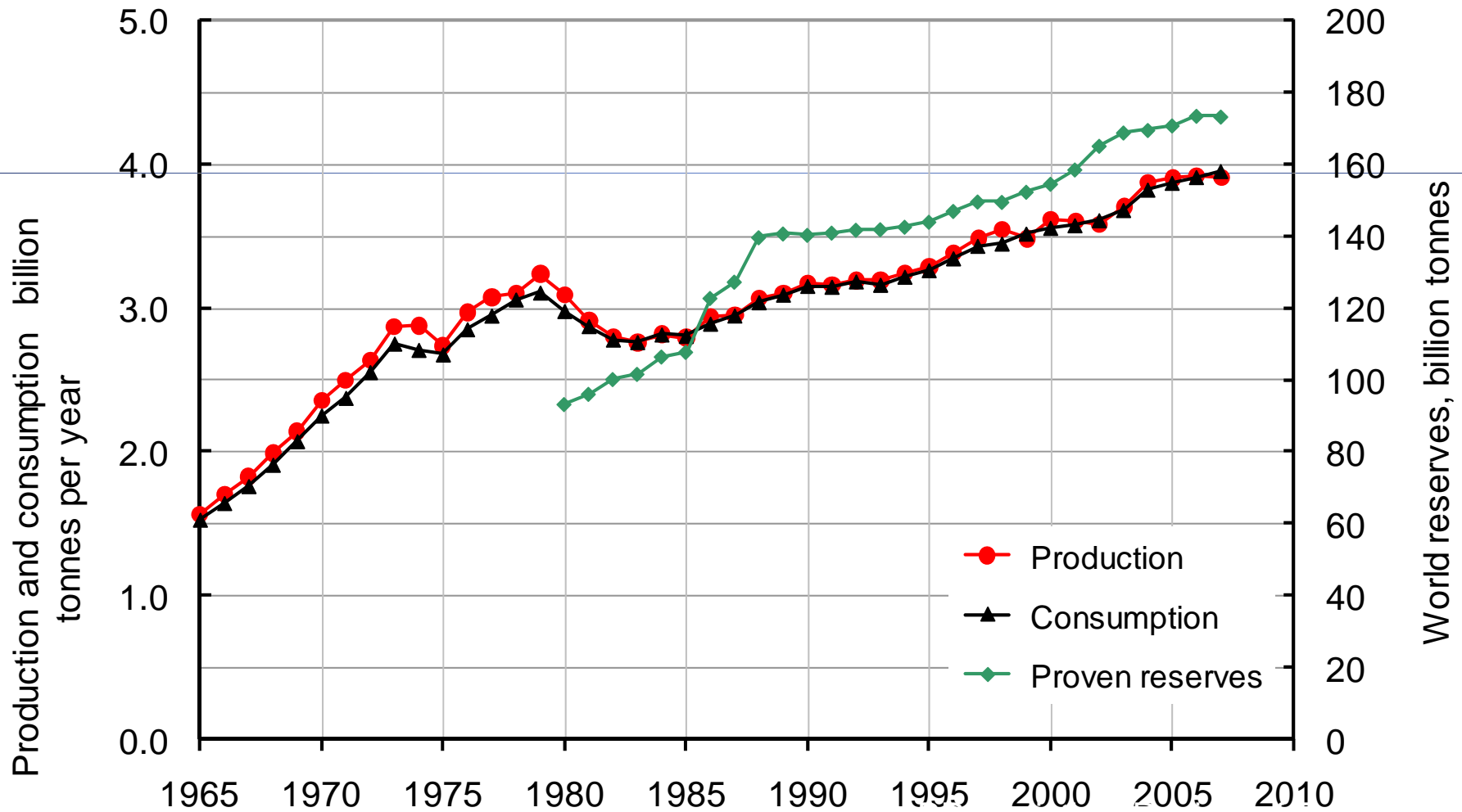


# US Oil Production

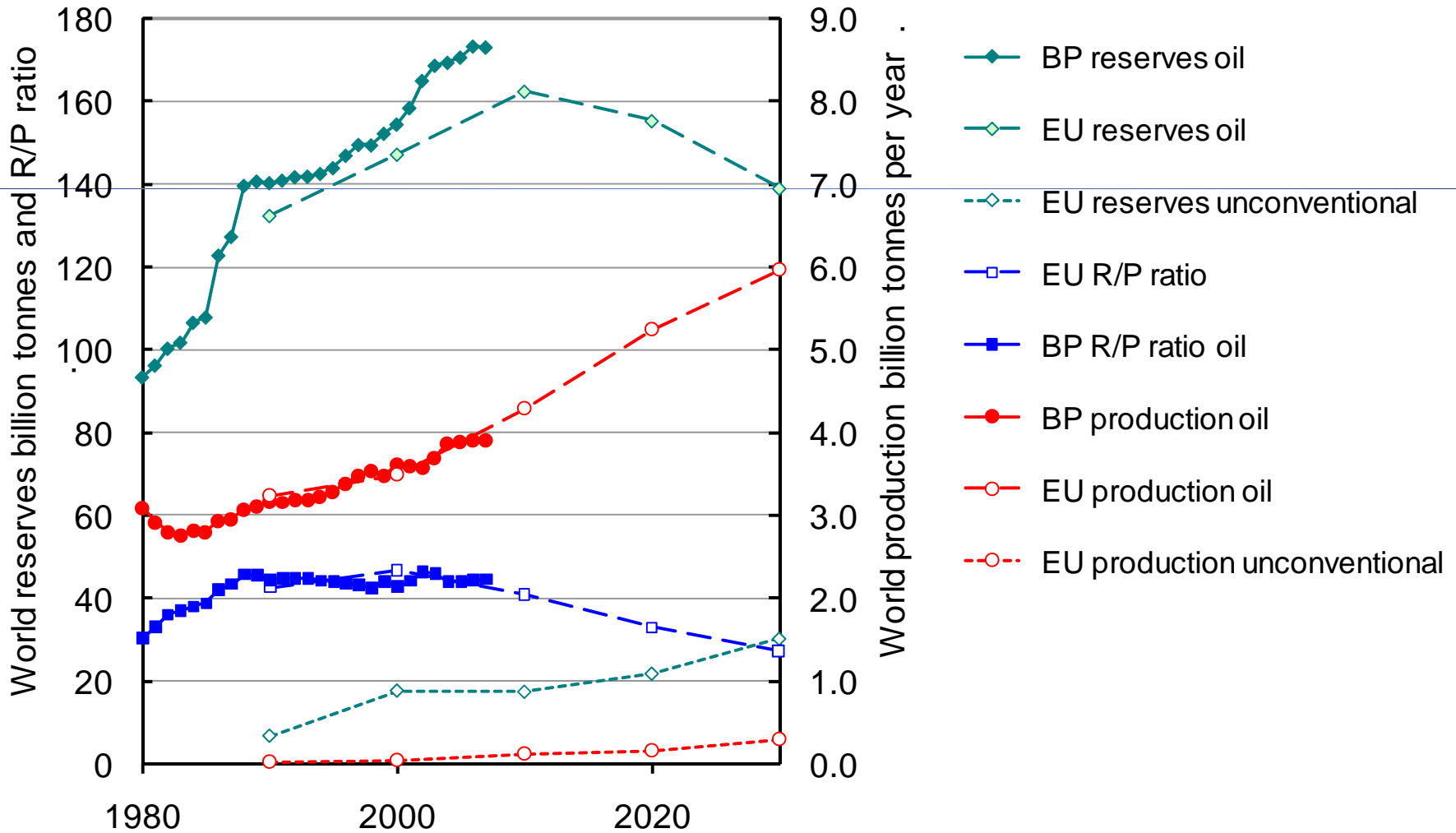


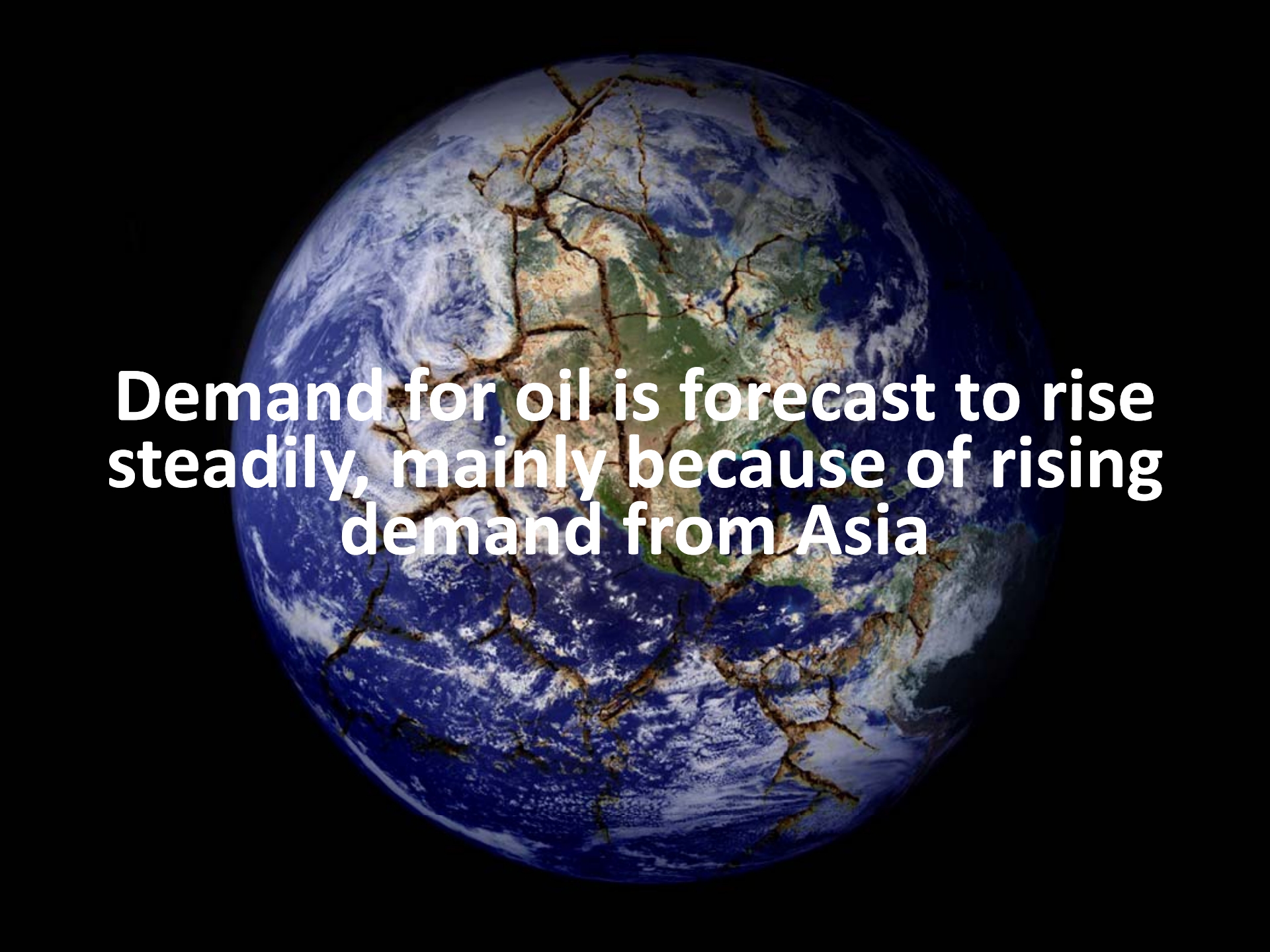
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- Until recently, the view that world oil production would peak early in the 21st century was regarded as maverick, but increasing numbers of analysts appear to consider this plausible.
  - In 2005 the US Department of Energy published a report “Peaking of World Oil Production: Impacts, Mitigation, & Risk Management”.

# World Crude Oil Production, Consumption and Reserves



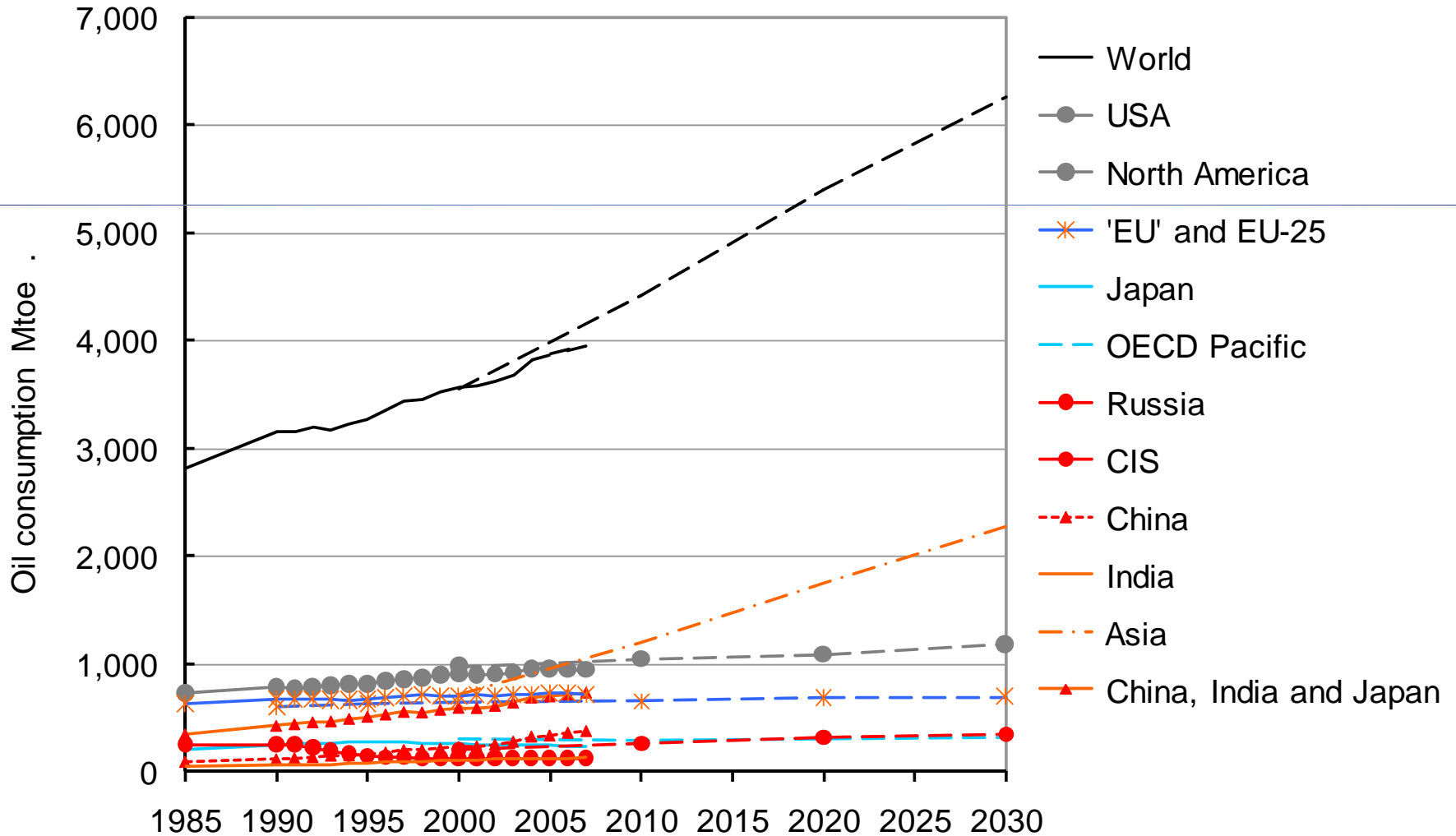
# Oil Production and Reserves History and Forecast



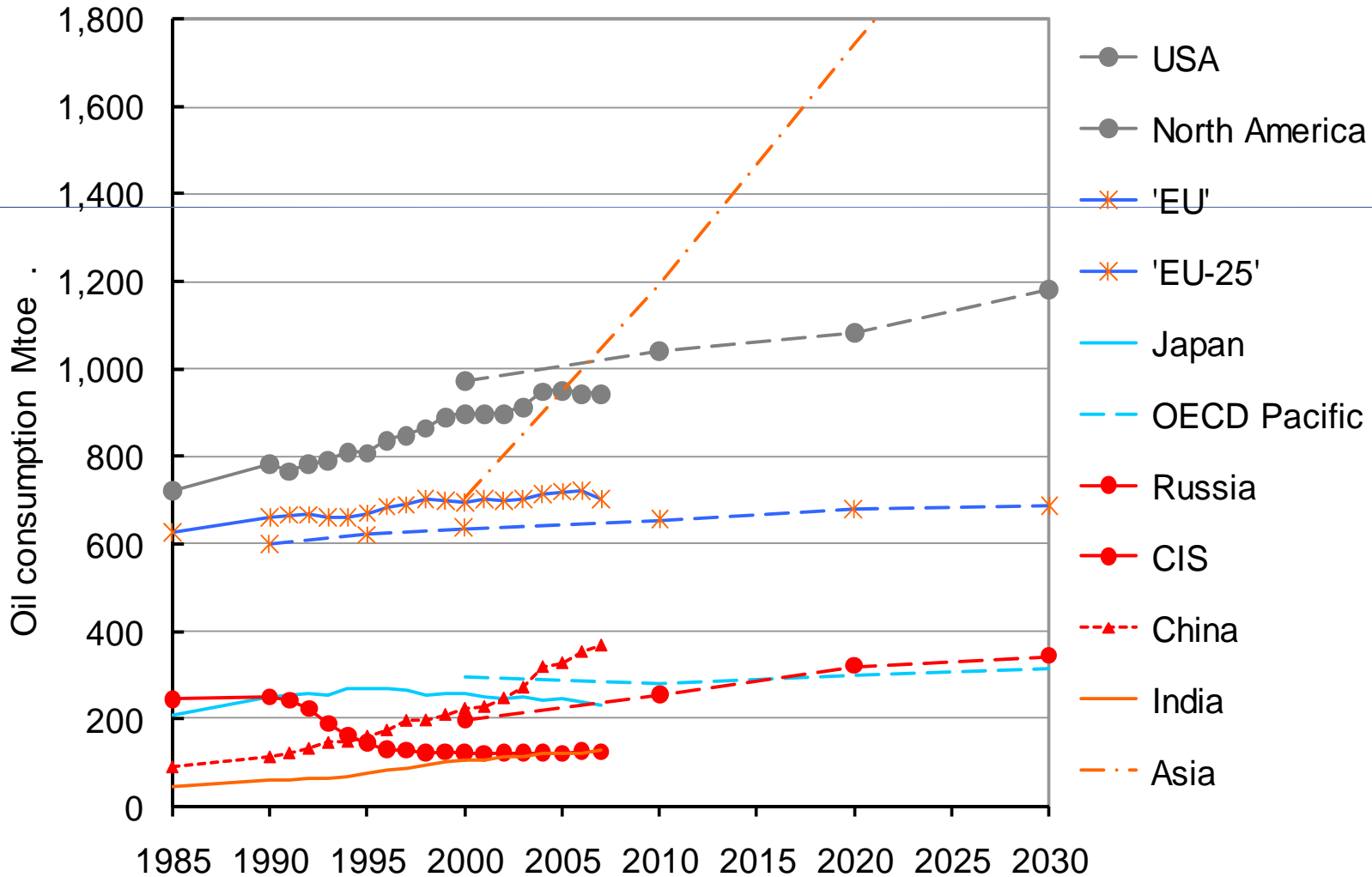
A satellite-style image of Earth showing the continents and oceans. Overlaid on the image is a network of brown, cracked lines that resemble a dry, cracked earth or a map of oil reserves and demand. The cracks are most prominent over the Middle East, Africa, and parts of Asia and South America. The text is centered over the image.

**Demand for oil is forecast to rise steadily, mainly because of rising demand from Asia**

# Oil Consumption – Actual and forecast (EU)



# Oil Consumption – Actual and forecast (EU)

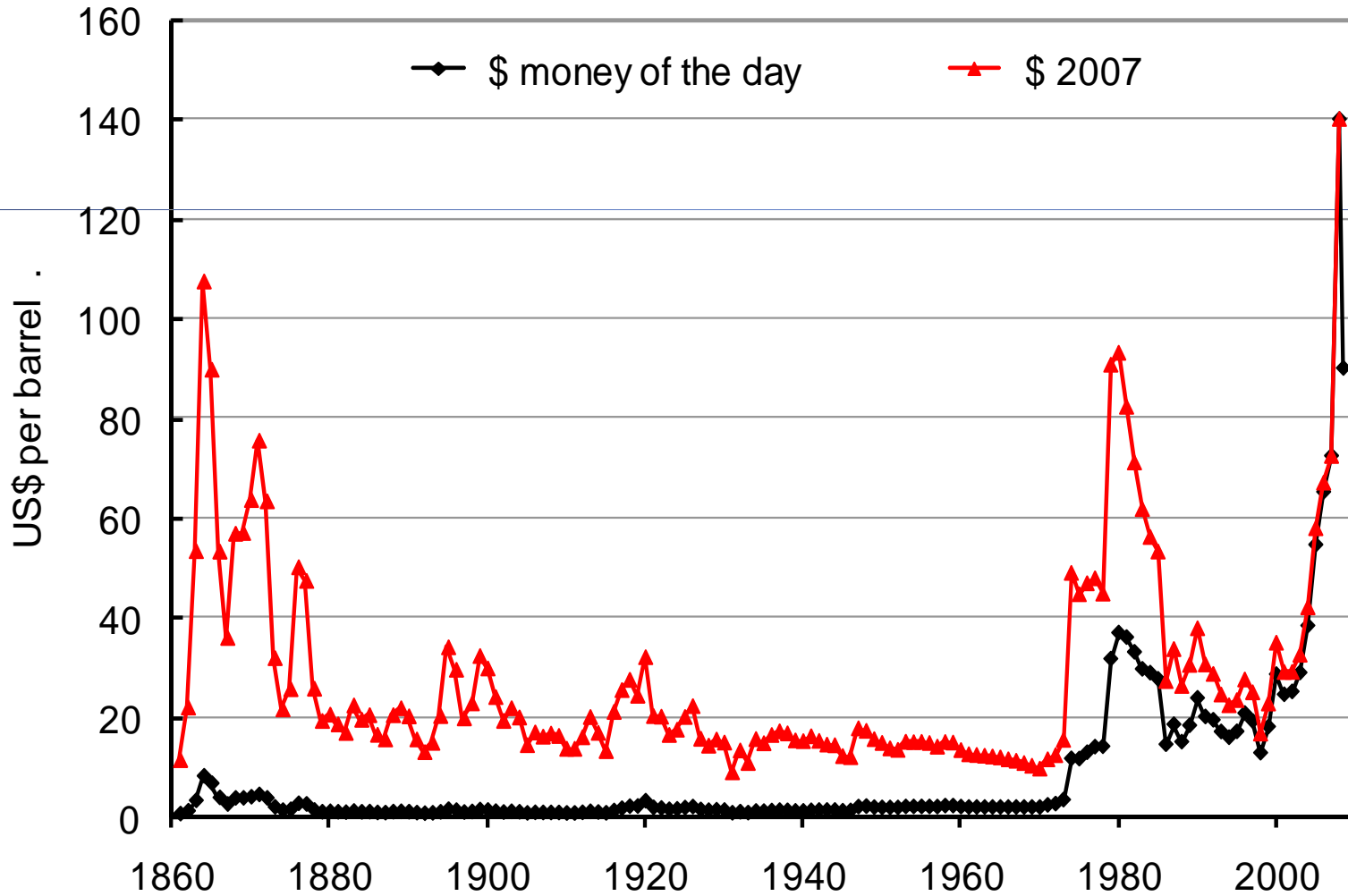


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**It is difficult to believe that the forecast demand can be satisfied.**

Therefore the price of crude oil will increase in the long term.

# Crude Oil Prices



- If demand exceeds production capacity, oil supplies could be disrupted
- Producers could retain oil for domestic use;
- Speculators could hoard oil while the price rises; and
- Military action could disrupt production.



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- Nobody knows when world oil production will peak, or the trend in production after the peak.
  - Many estimate the peak will occur between 2008 and 2020.
  - Some predictions show a rapid fall in world production once the peak is passed.

# Peaking Of World Oil Production: Impacts, Mitigation, & Risk Management Netl, Us Department Of Energy, 2005

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- The challenge of oil peaking deserves immediate, serious attention, if risks are to be fully understood and mitigation begun on a timely basis.
- Oil peaking will create a severe liquid fuels problem for the transportation sector, not an “energy crisis” in the usual sense that term has been used.

# Peaking Of World Oil Production: Impacts, Mitigation, & Risk Management Netl, Us Department Of Energy, 2005 (cont)

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- Peaking will result in dramatically higher oil prices, which will cause protracted economic hardship in the United States and the world. However, the problems are not insoluble.
- Mitigation will require a minimum of a decade of intense, expensive effort, because the scale of liquid fuels mitigation is inherently extremely large.

# Peaking Of World Oil Production: Impacts, Mitigation, & Risk Management Netl, Us Department Of Energy, 2005 (cont)

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- Production of large amounts of substitute liquid fuels will be required.
- In summary, the problem of the peaking of world conventional oil production is unlike any yet faced by modern industrial society. The challenges and uncertainties need to be much better understood. Technologies exist to mitigate the problem. Timely, aggressive, risk management will be essential.

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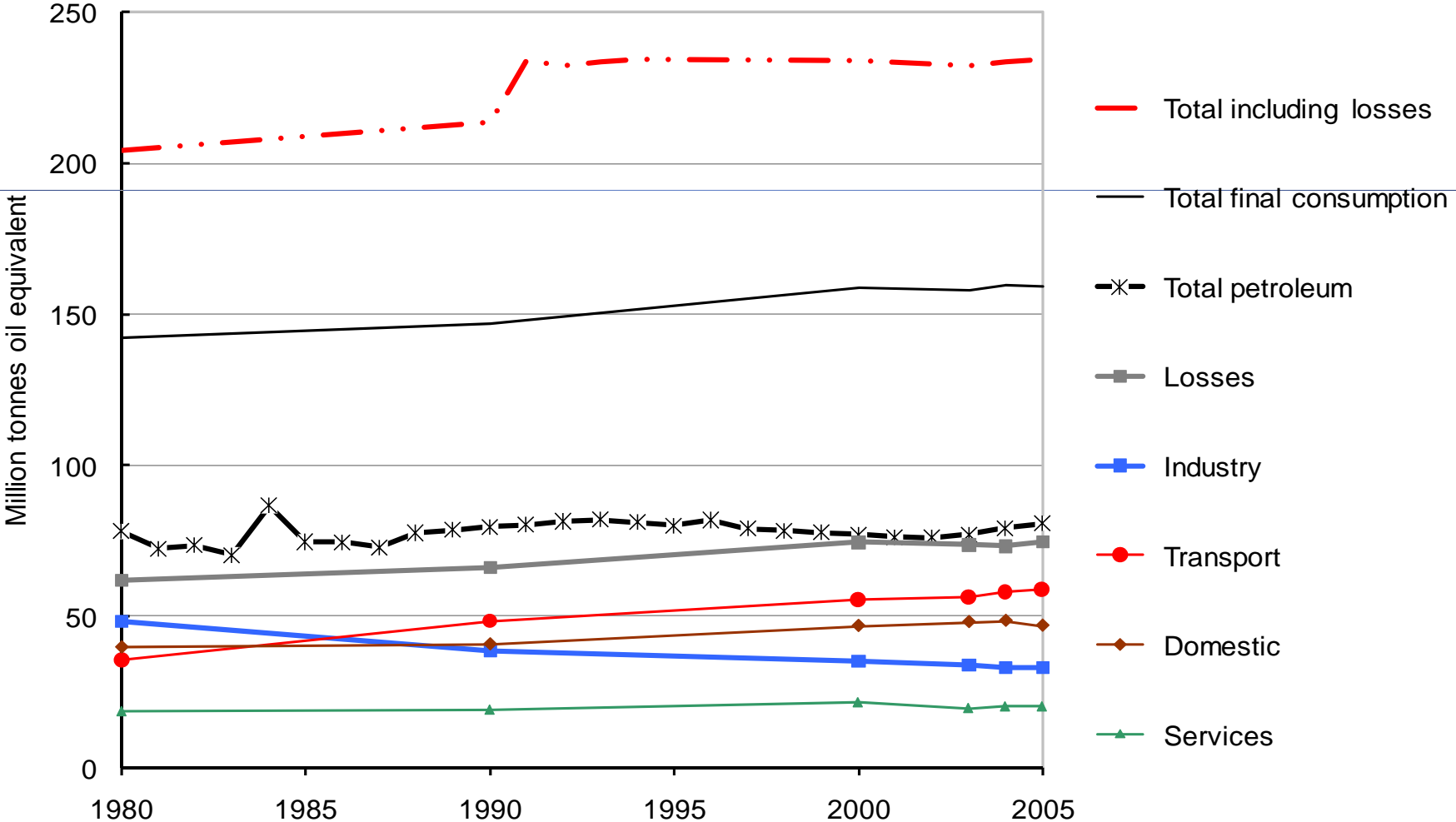
**One effect of the price of oil increasing,  
and supply difficulties, could be a move  
to make greater use of coal.**

This has serious implications for  
accelerating climate change.

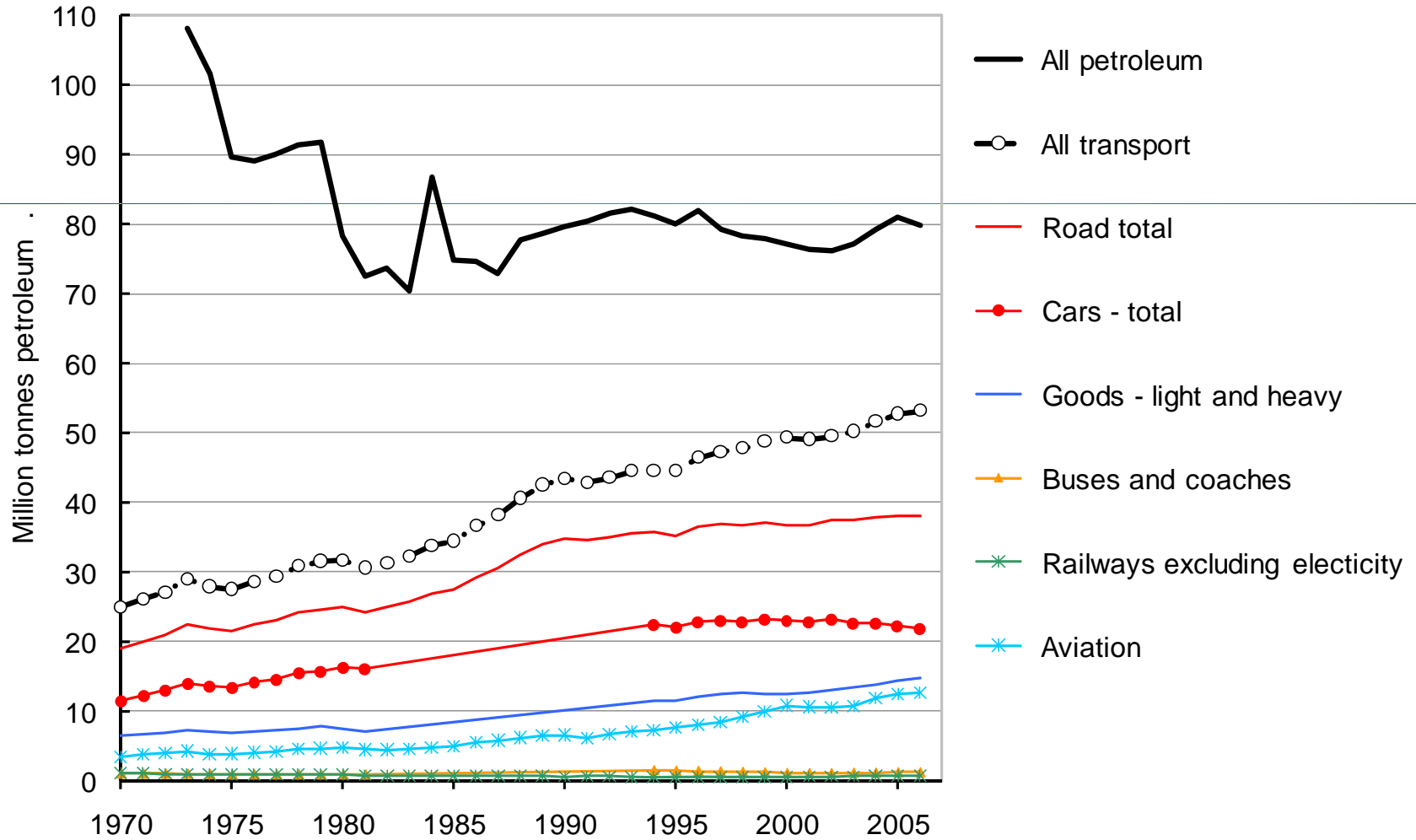


# Use of energy and oil in UK

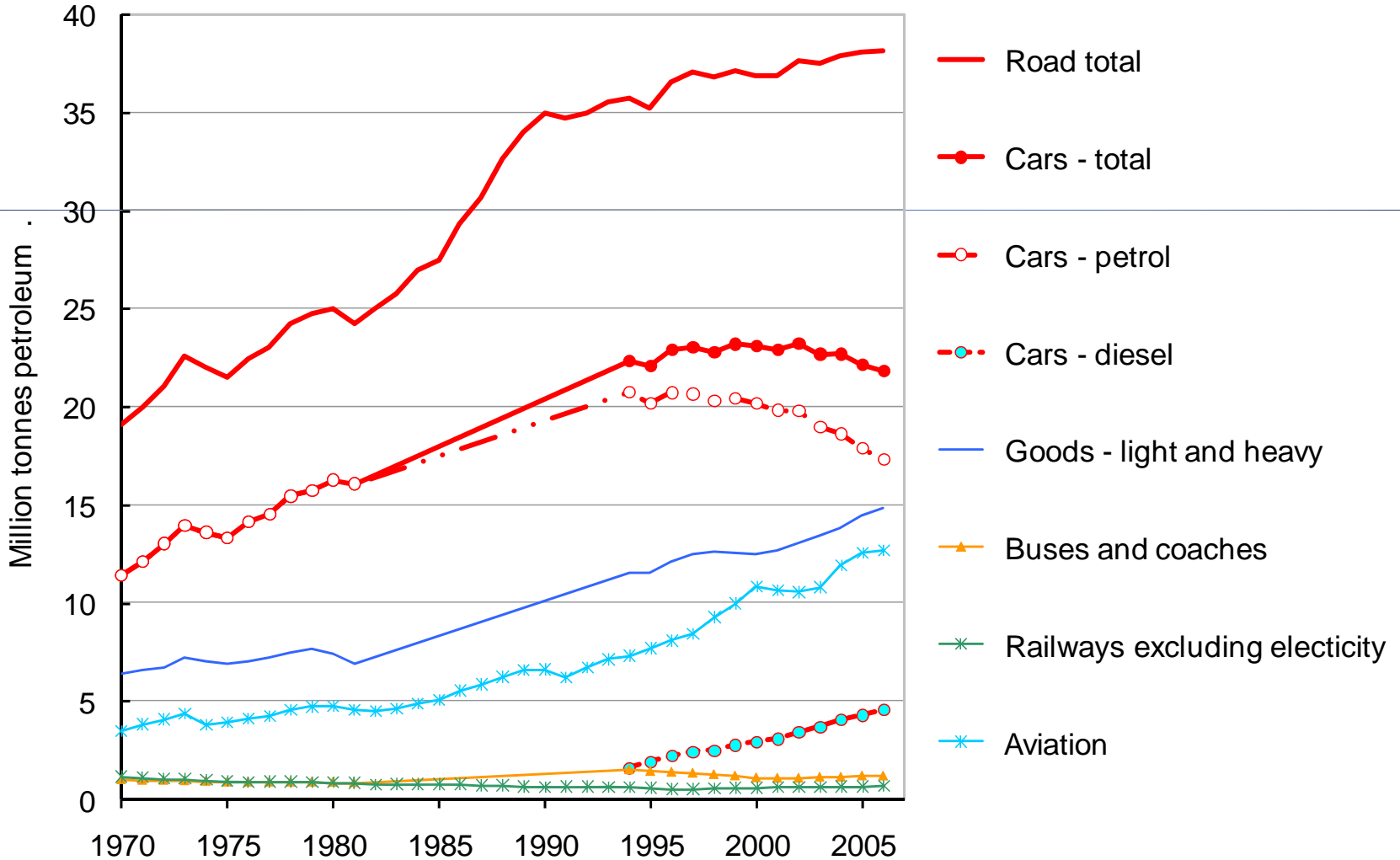
# UK Inland Energy Consumption - DTI



# Petroleum Use in UK



# Petroleum Use in UK for Transport



# Likely policies if fuel supply is interrupted

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- Priority activities, after emergency and defence services, will be freight transport, buses and rail
- Fuel would have to be rationed for priority users
- Walking and cycling will increase substantially

# Possible scenarios

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- Some suggest that peak oil will lead to a collapse of economically developed societies.
- In a more optimistic scenario, the economy recognises the priority to develop energy supplies that do not emit CO<sub>2</sub>. Rising oil prices accelerate this process. As oil supplies run down, alternative fuels smoothly fill the gap.

# Implications for transport planners

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- The resilience of plans and investments to increased price of fuel and possible supply disruption should always be considered.
- New settlements and developments should be planned to work without relying on private cars
- Walking as a viable mode depends on land use locating housing and activities sufficiently close together

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**These requirements are similar to those for environmental sustainability, and also for liveable communities, particularly for an ageing population.**

Land use and transport planners should include the security of oil supplies with other constraints and objectives.





**Climate change**

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**Man's activities are releasing into the atmosphere gases that trap the Earth's heat.**

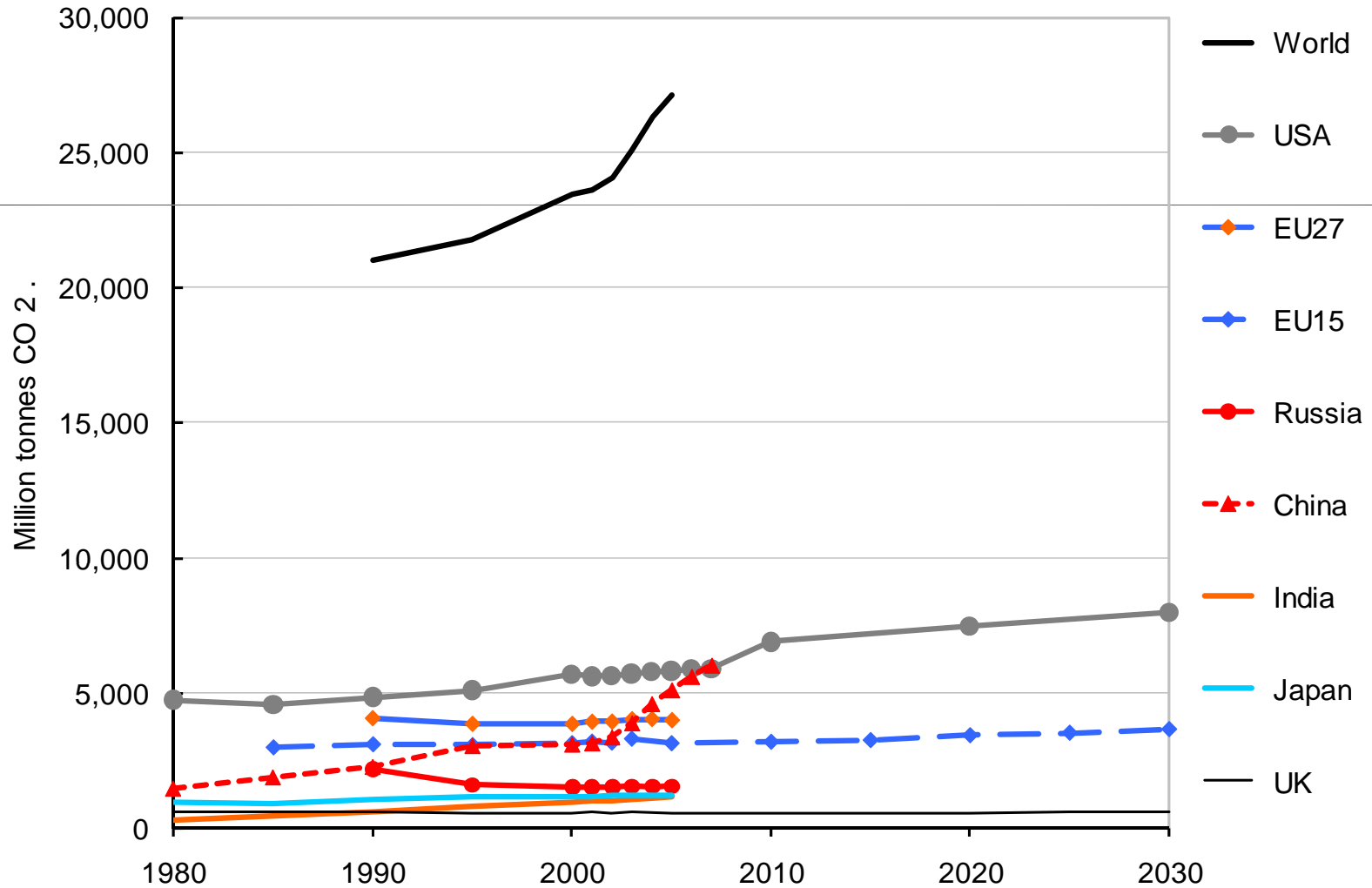
Called 'greenhouse gases', they include carbon dioxide CO<sub>2</sub>, methane, nitrous oxide and various industrial gases.

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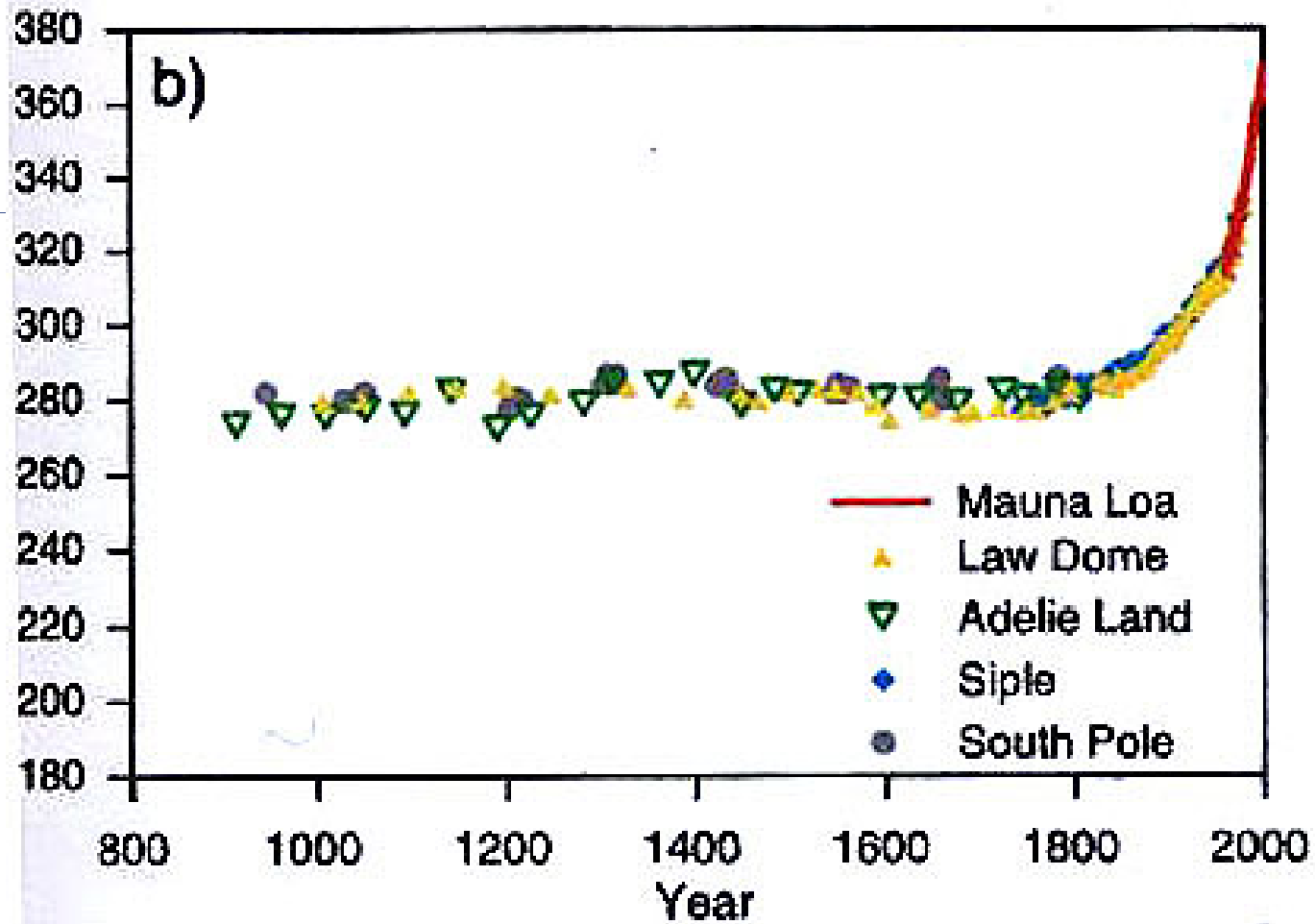
**Carbon dioxide CO<sub>2</sub> lasts around 200  
years in the atmosphere.**

CO<sub>2</sub> emissions are increasing.

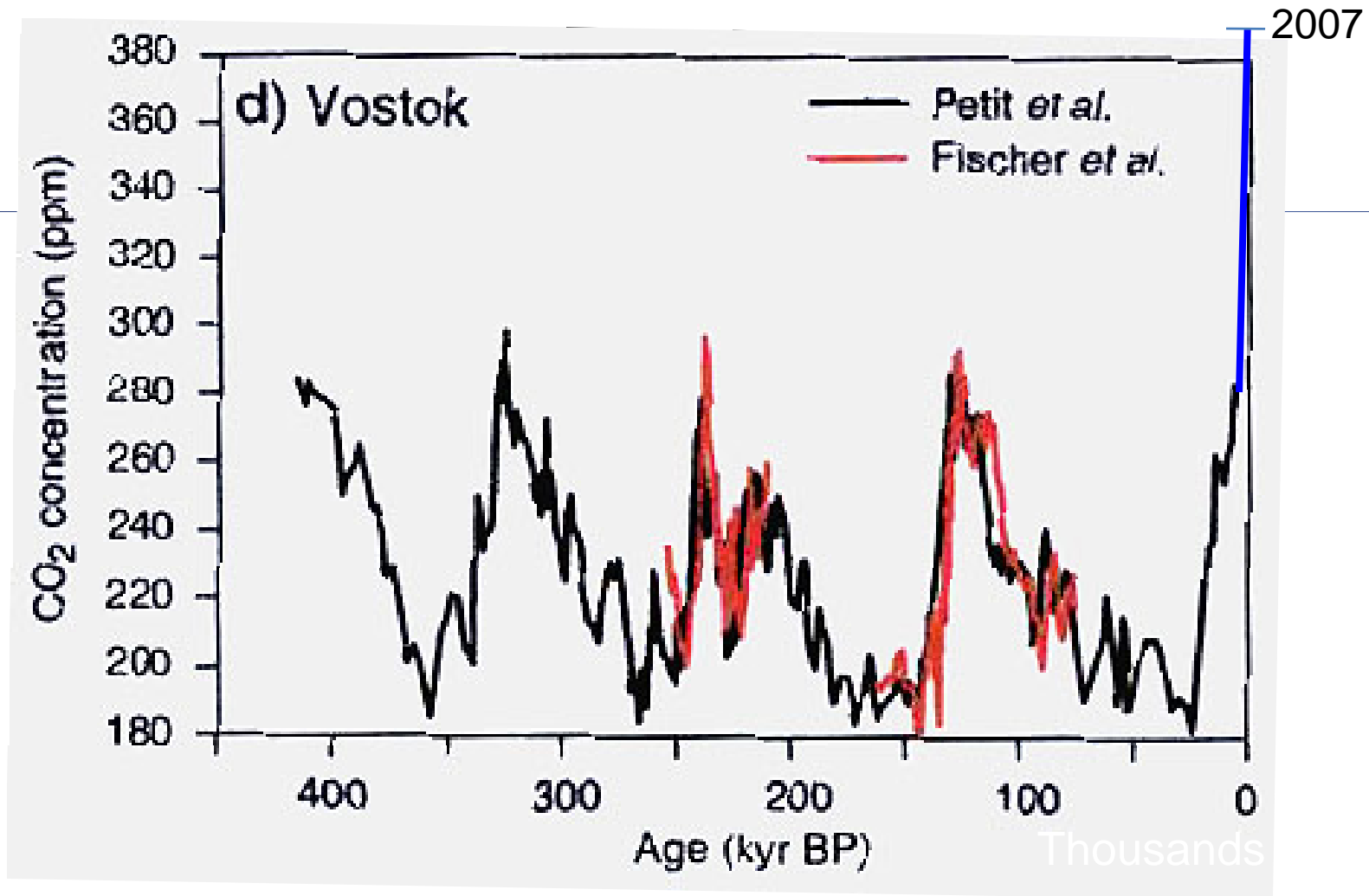
# CO<sub>2</sub> Emissions - All Energy Use



# Concentration of CO<sub>2</sub>

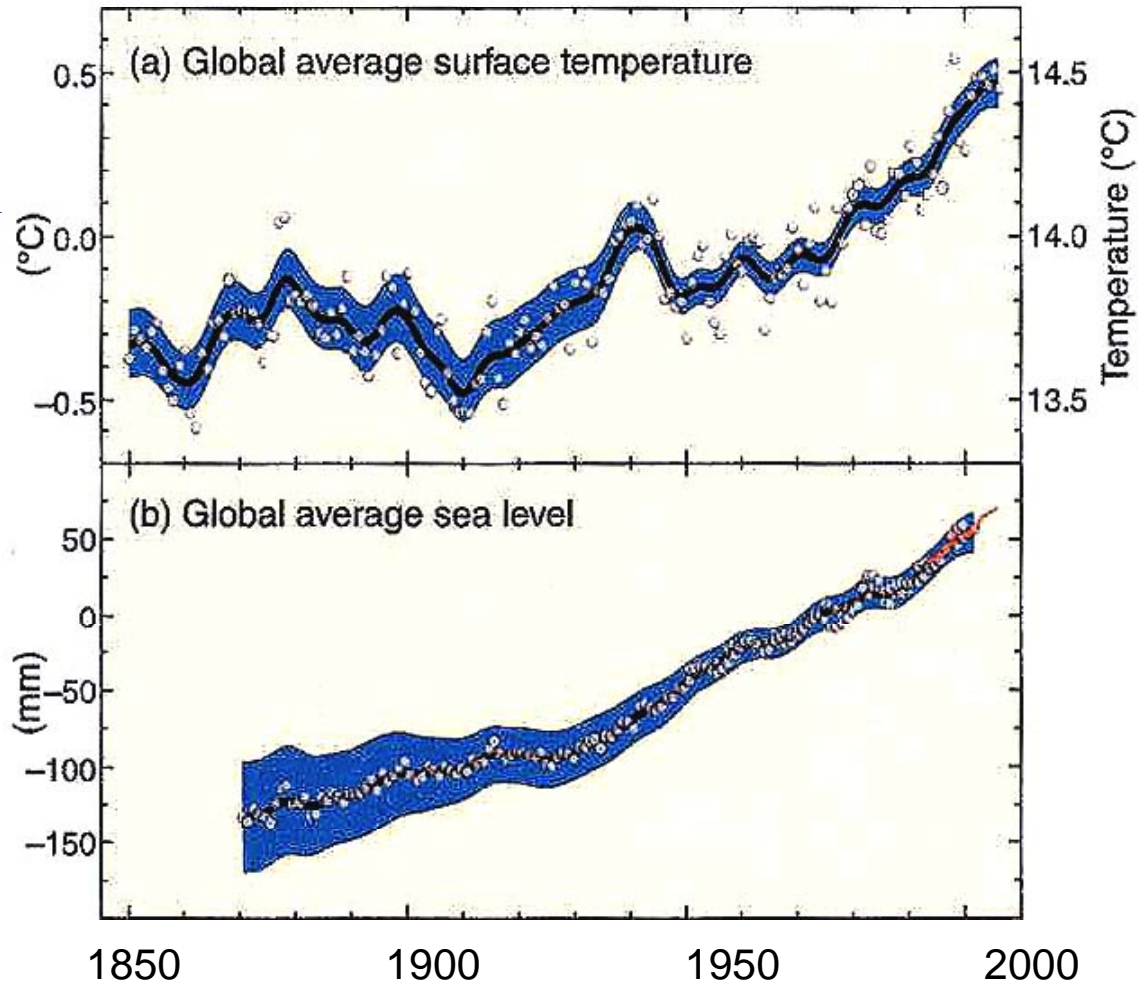


# Concentration of CO<sub>2</sub>

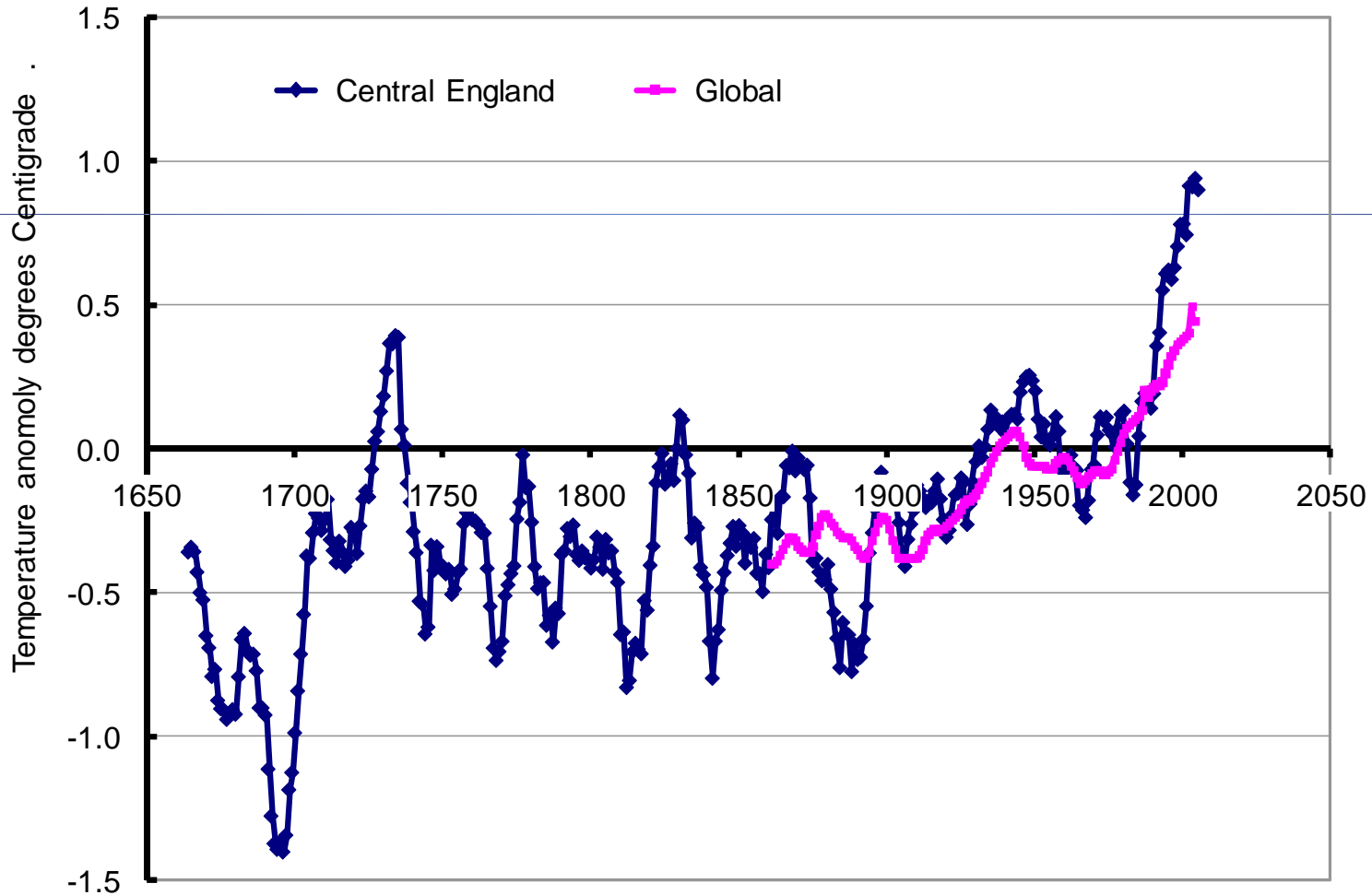


# Changes In Global Temperature And Sea Level

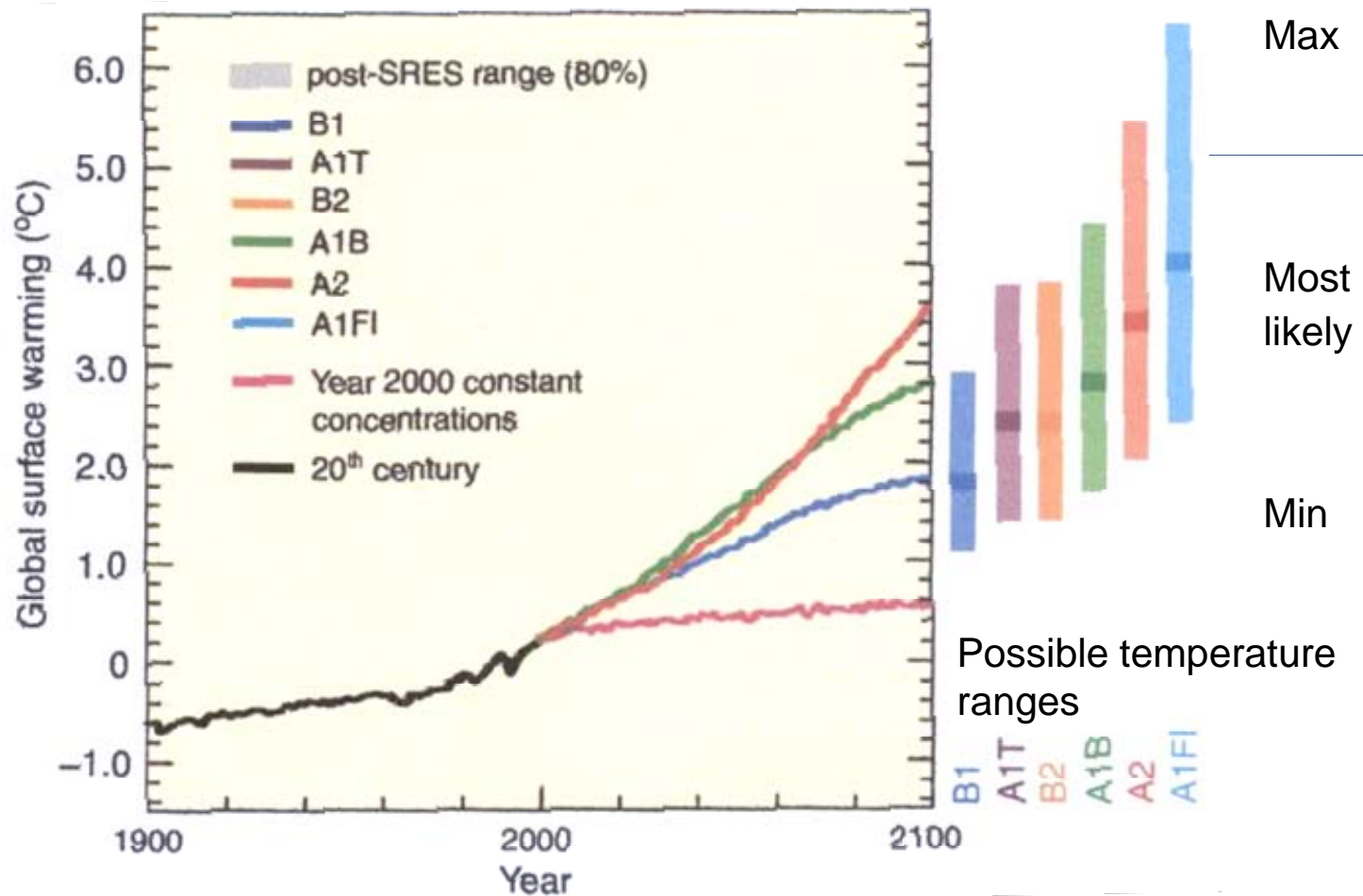
Difference from average over 1961 - 1990



# Temperature Anomaly England And Global



# Forecast Average Surface Temperature IPCC Report 4

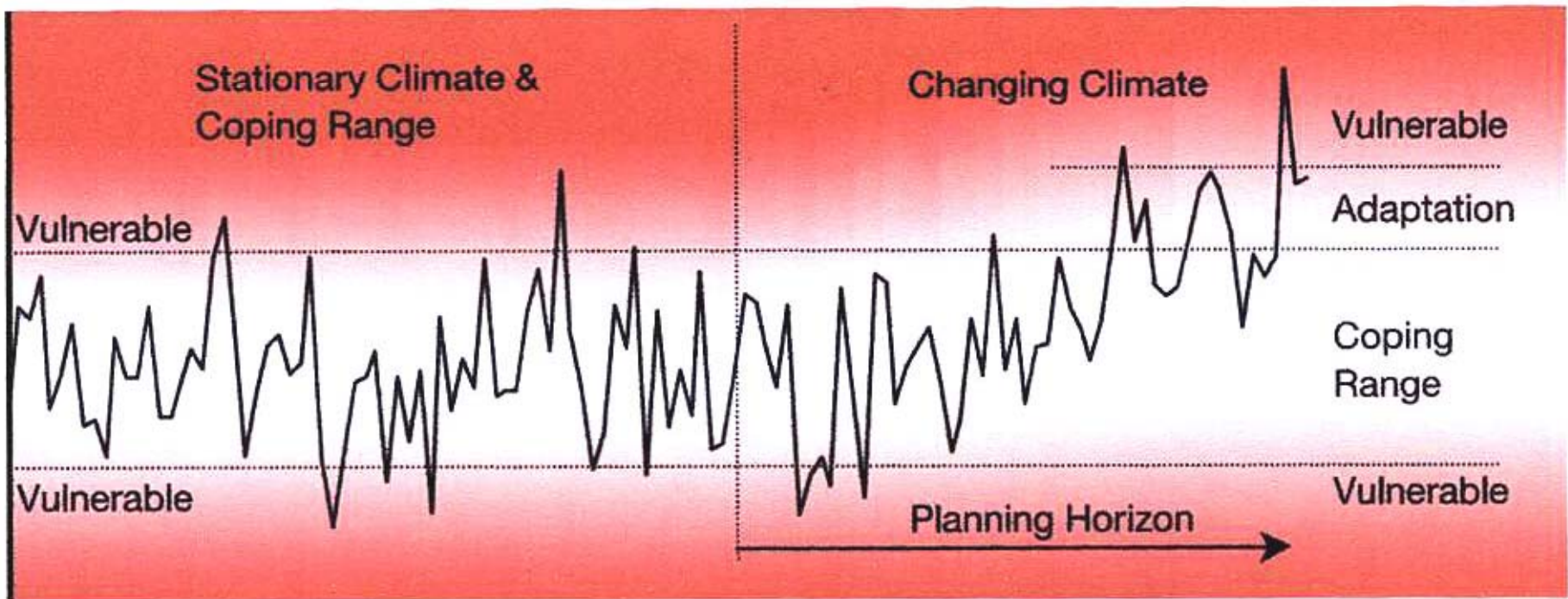


# Responses to climate change:

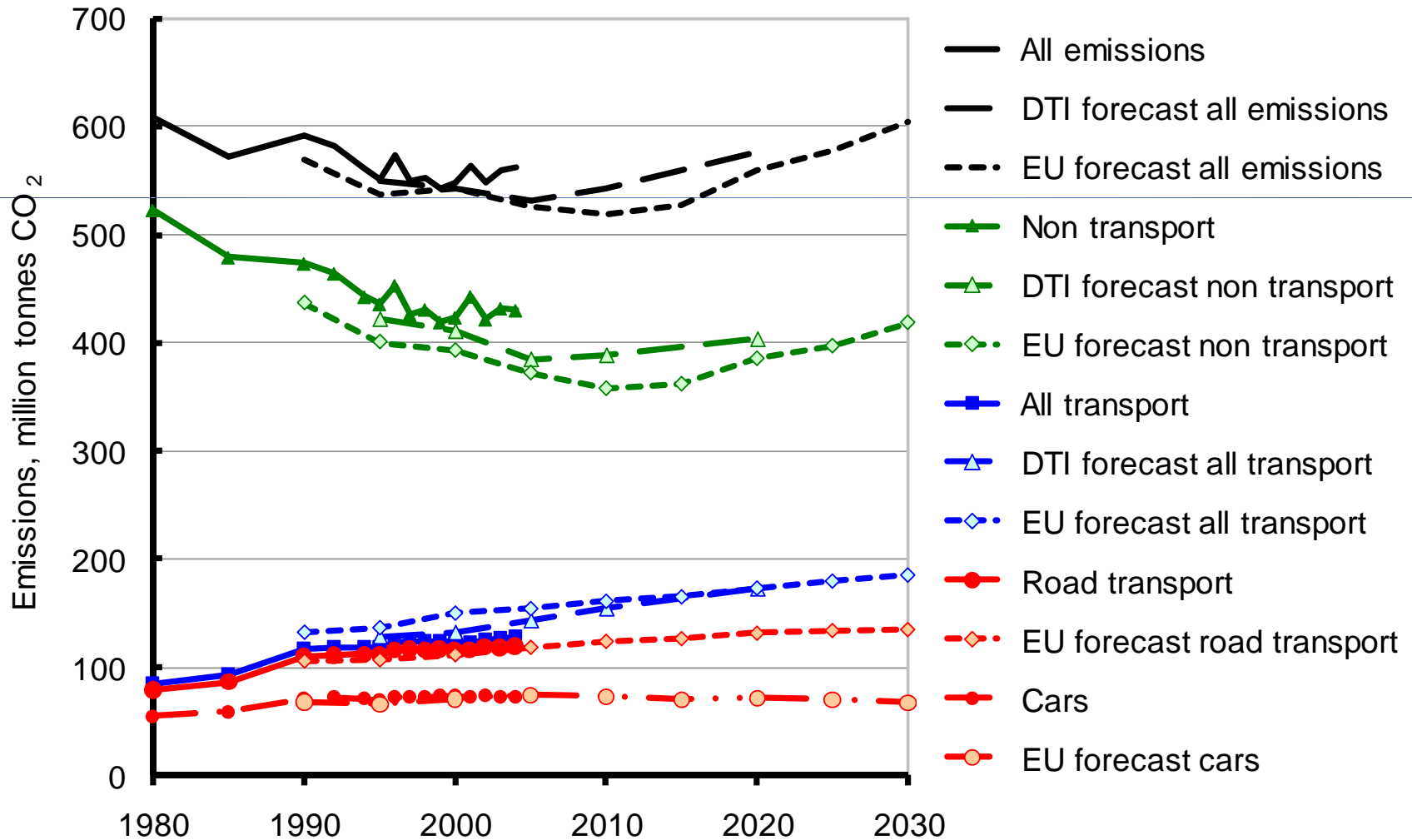
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- Mitigate by limiting emissions
- Adapt to inevitable changes to come
  - Increased average and extreme temperatures
  - Increased winter rain and torrential summer downpours
  - Rising sea levels
  - More severe storms

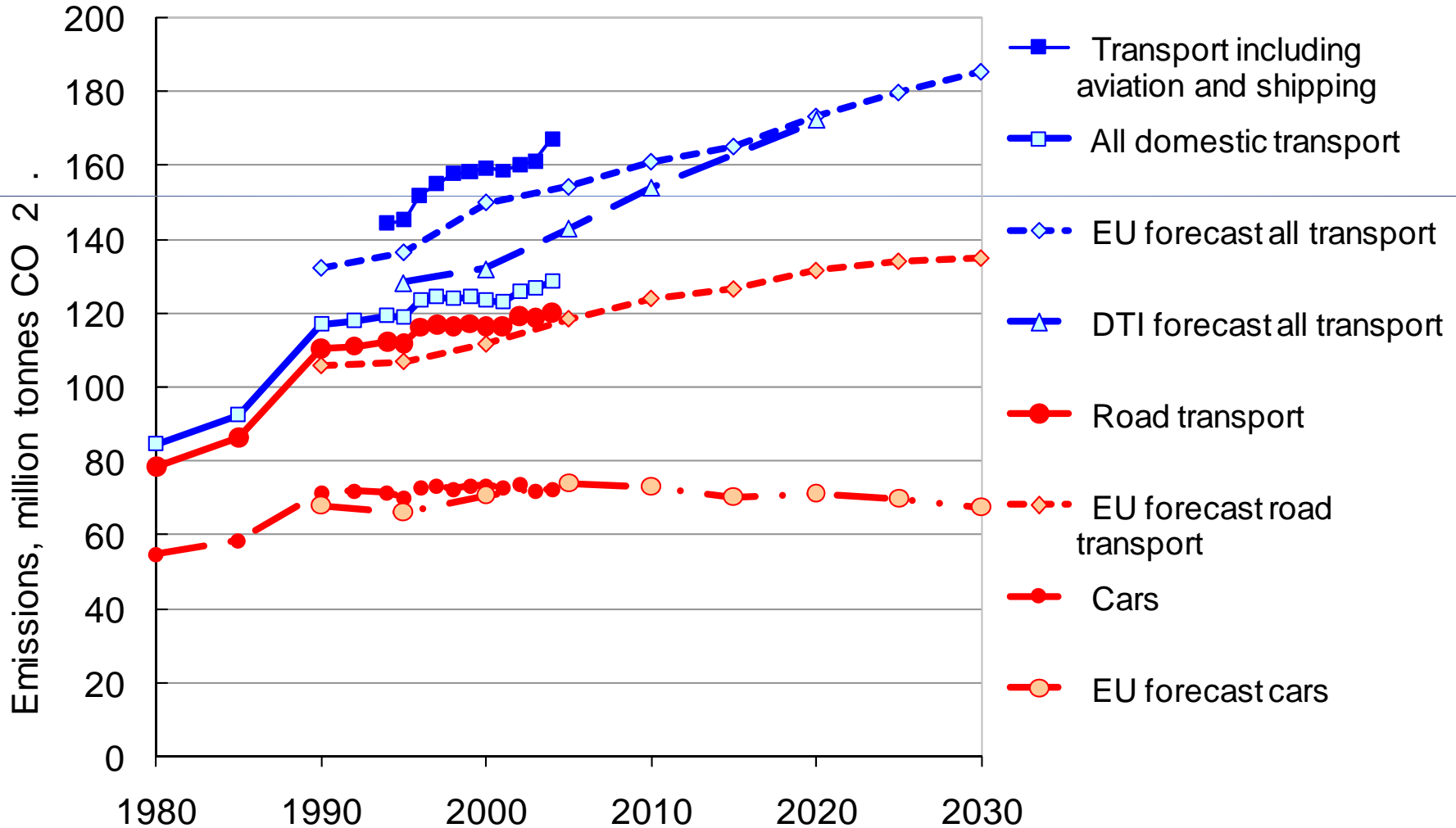
# Coping and Adaptation Ranges



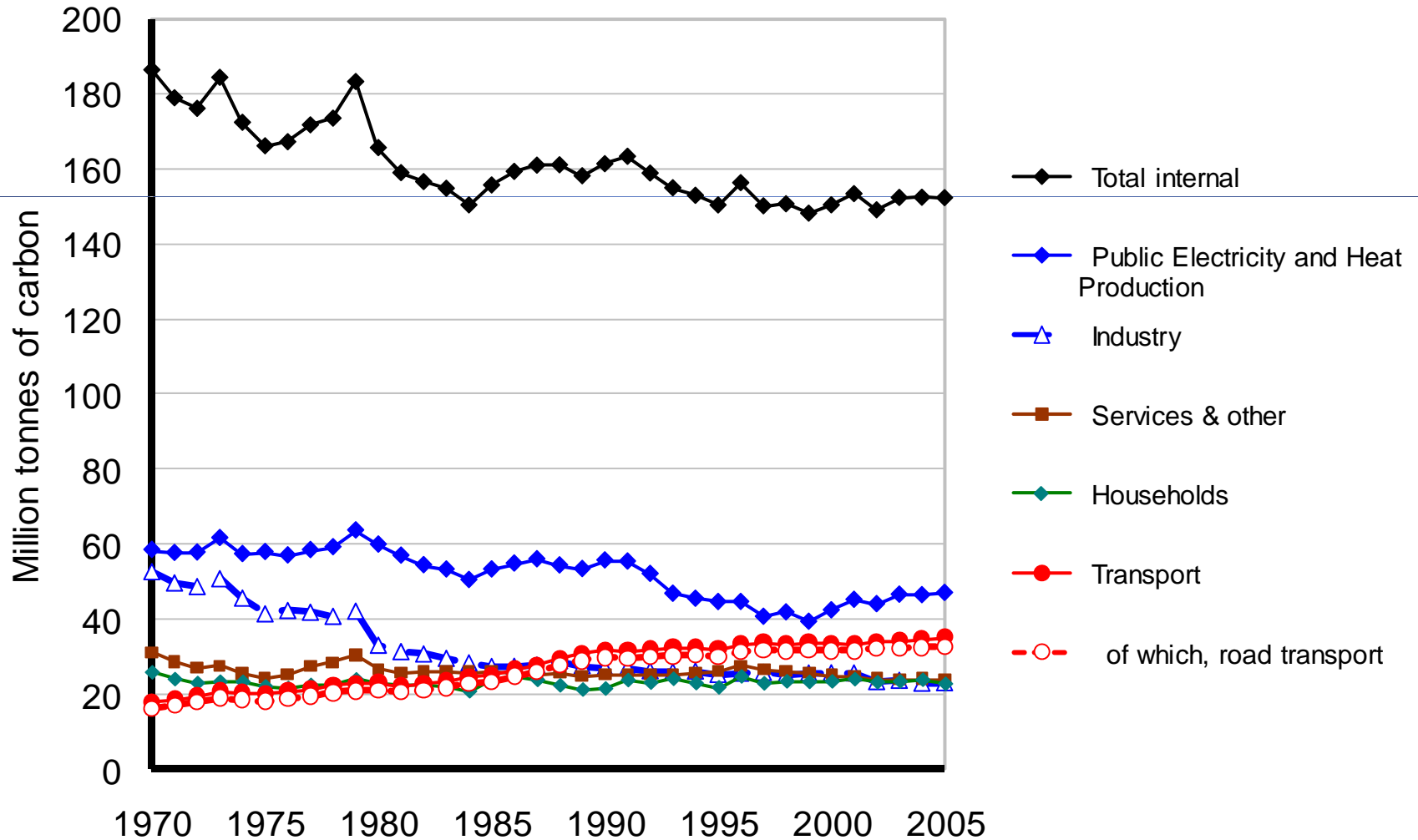
# CO<sub>2</sub> Emissions and Forecast - UK



# CO<sub>2</sub> Emissions and Forecast UK Transport



# Carbon Dioxide Emissions By Sector - UK



# Energy Use

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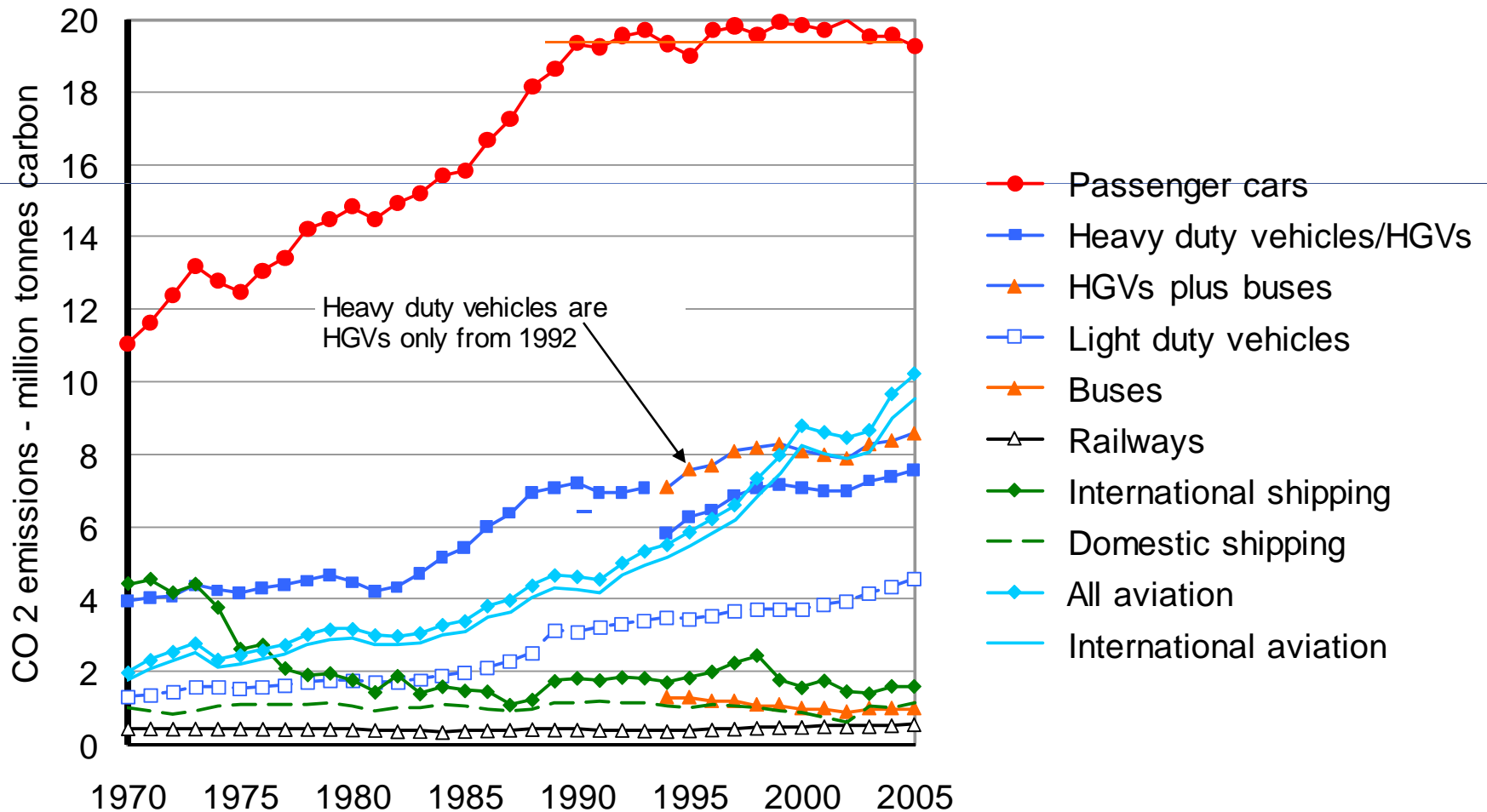
- Carbon emissions from road transport almost stable, with emissions from cars falling slowly and from goods vehicles rising
- Government now aspires to reduce carbon emissions by at least 80 percent by 2050, to stabilise carbon dioxide in atmosphere at 450 ppm
- Not yet clear on the implications of this for transport, but reduced use of cars and aircraft almost certainly required

# Mitigation

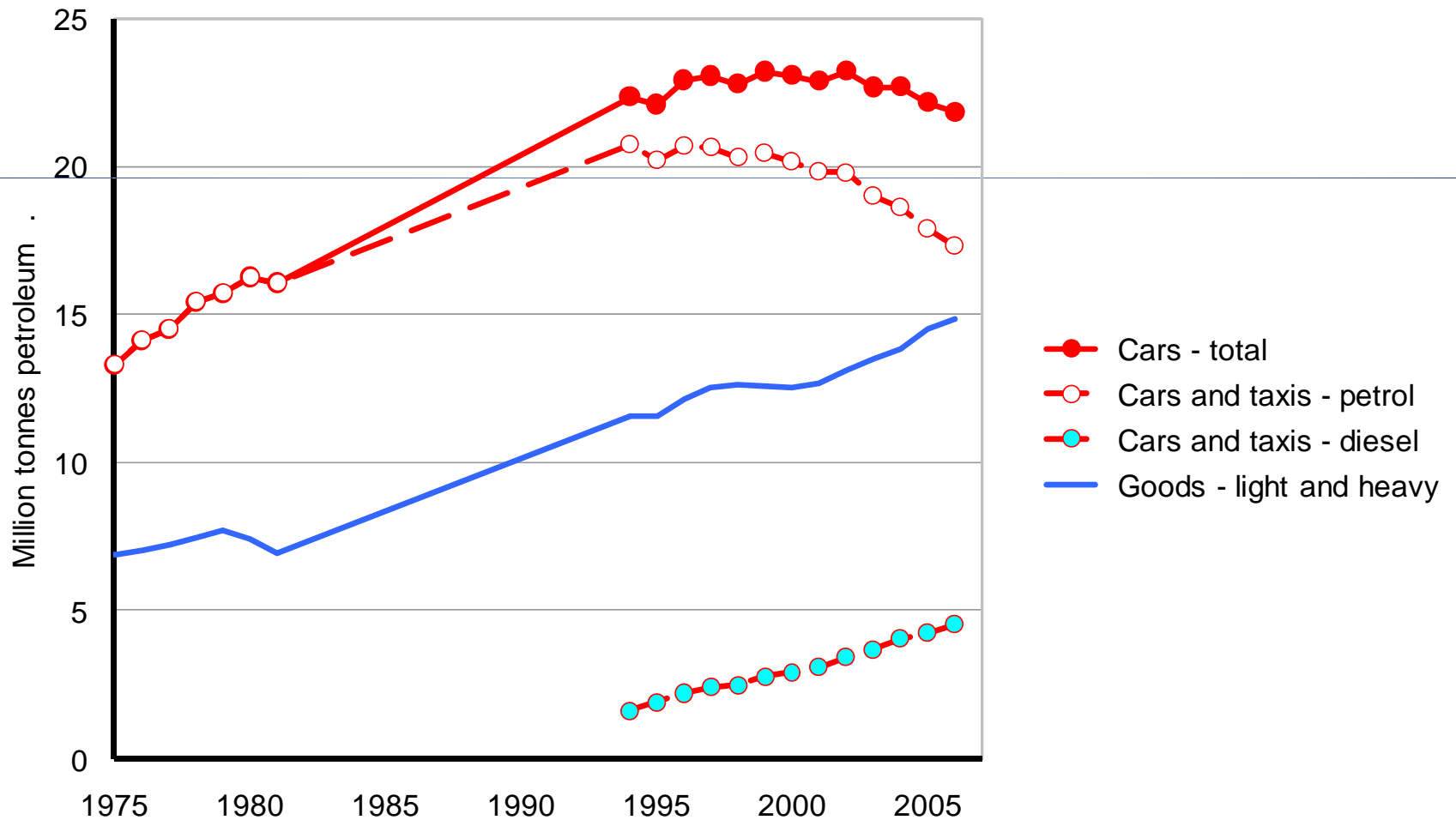
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- Fuel consumption of cars has already improved significantly
- Total fuel used by cars is now decreasing, despite traffic increasing until recently

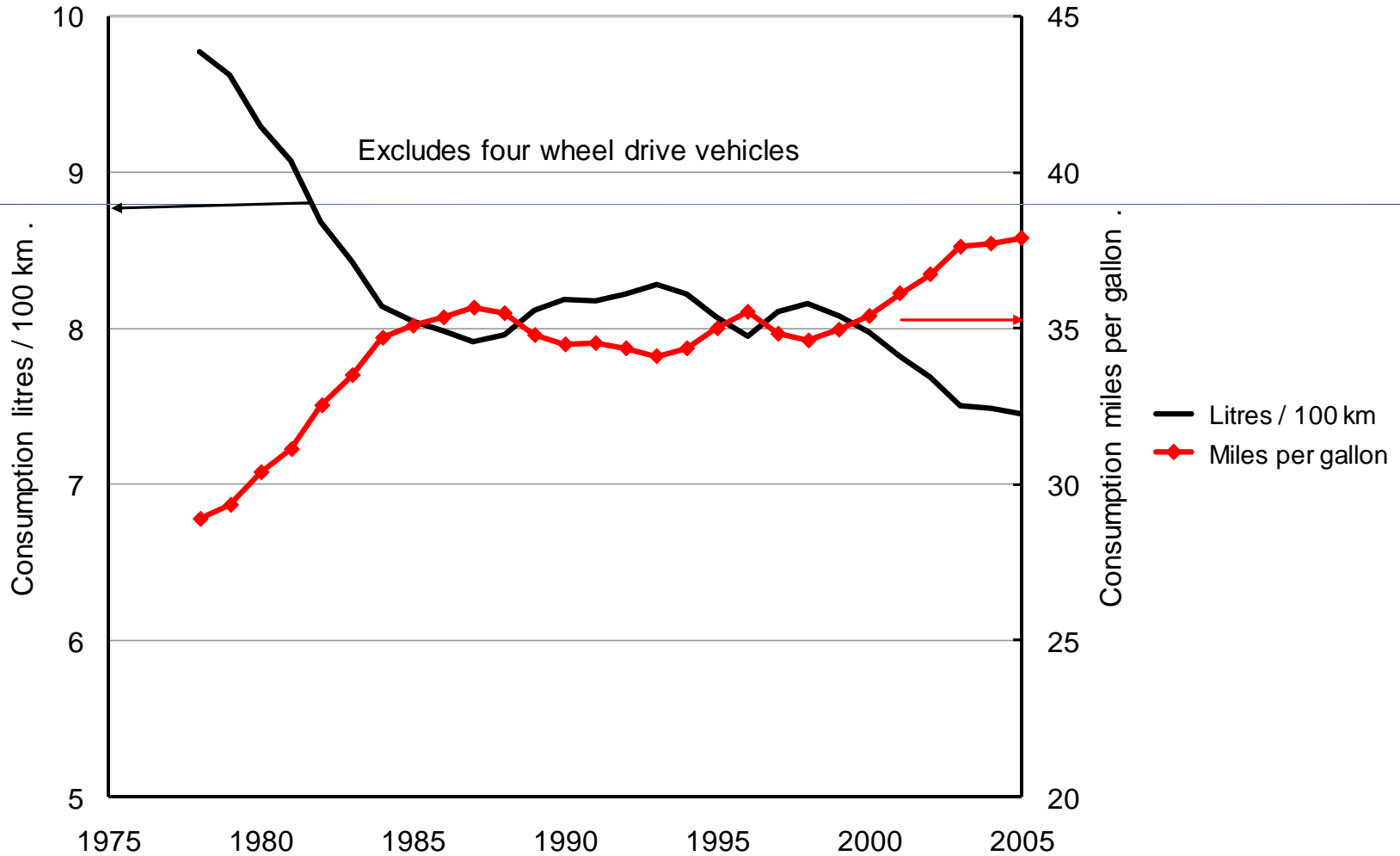
# Carbon Dioxide CO<sub>2</sub> Emissions From Transport - United Kingdom



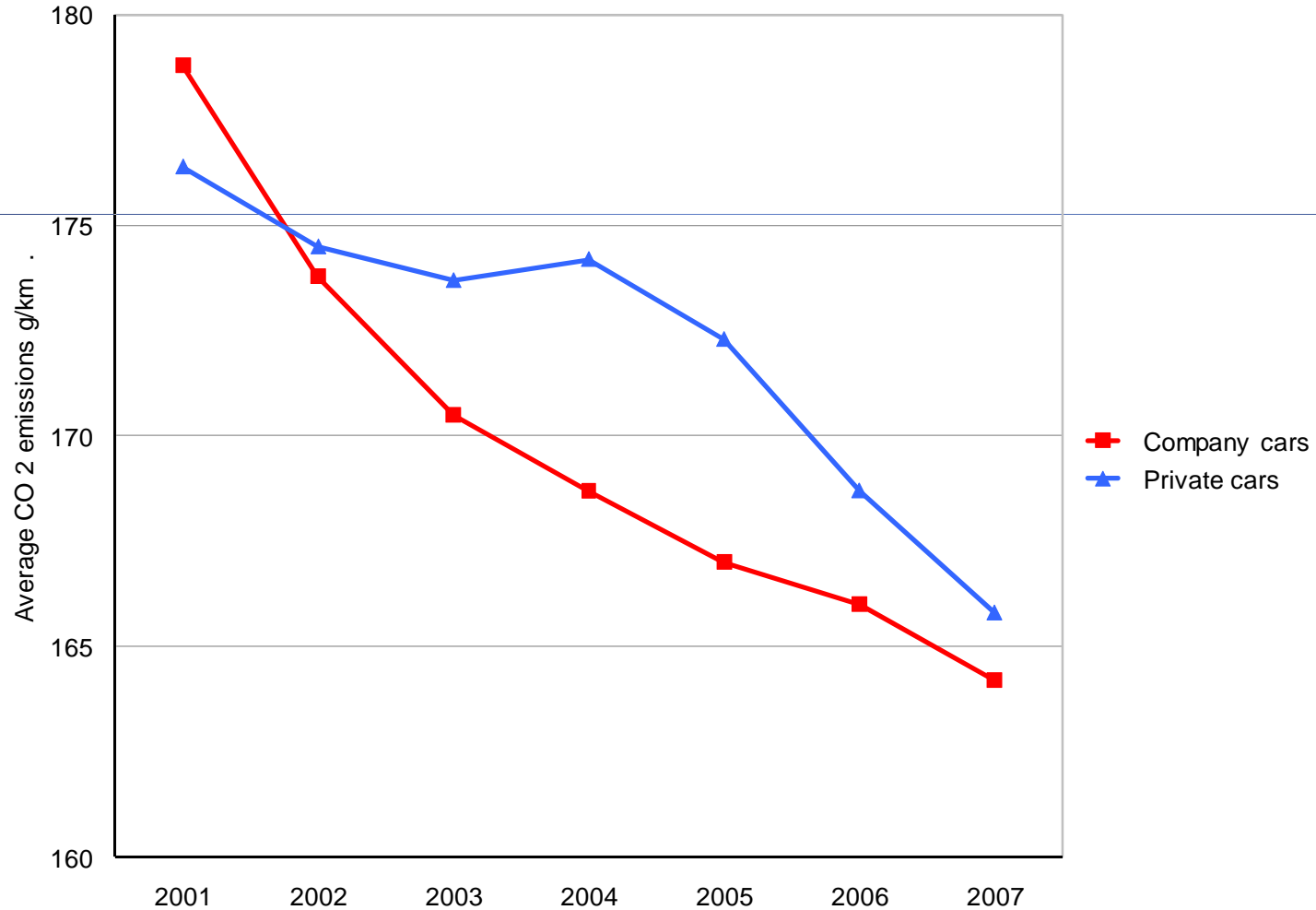
# Petroleum Use by Cars in UK



# New Car Average Fuel Consumption



# New Car CO<sub>2</sub> Emissions



# King Review of Low-Carbon Cars

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- Technology that can reduce CO<sub>2</sub> emissions per car by 30 per cent is close to market and could be standard within 5 -10 years.
- Cars that emit 50 per cent less CO<sub>2</sub> per kilometre than the equivalent current models could be on the road by 2030, subject to advances in hybrid and battery technologies.
- Longer term, vehicle technologies to enable a 90% reduction in emissions are feasible.

# Percentage of Total Distance by Car Access 2006

