Carbon capture and storage: a key mitigation technology

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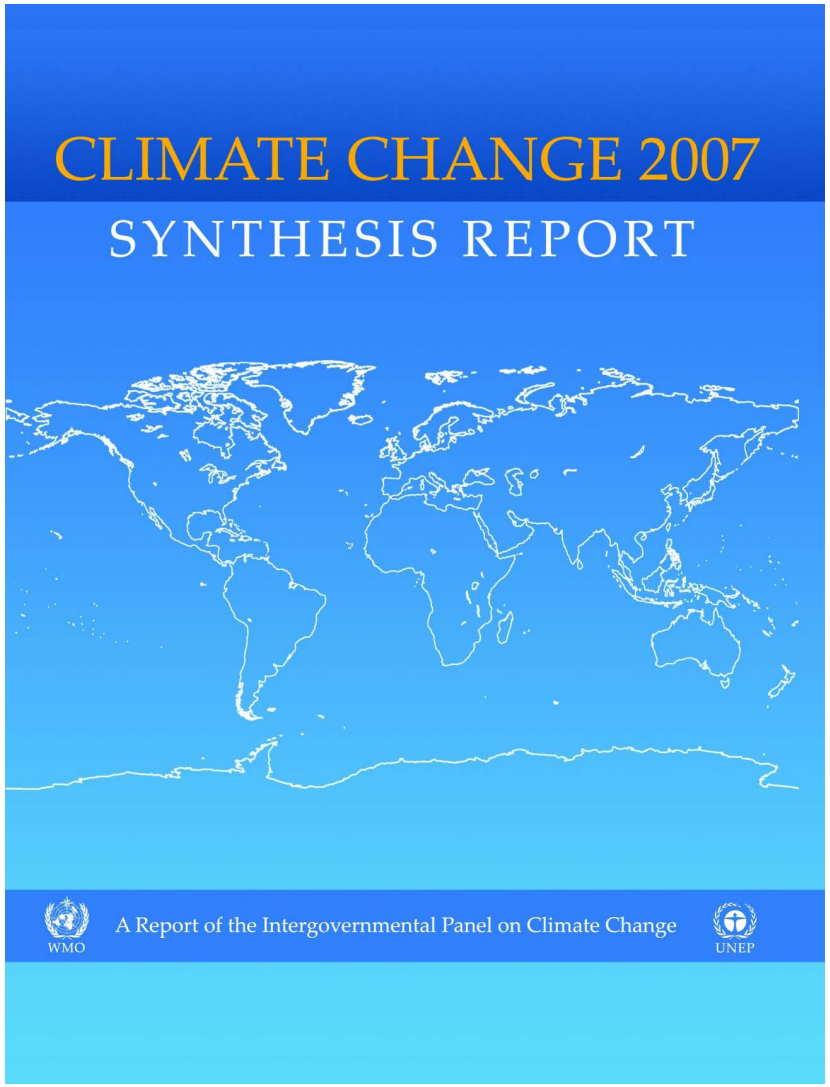
Second EU-OPEC Roundtable on Carbon Capture and Storage
Brussels, 31st October 2008

Follows First Roundtable in Riyadh

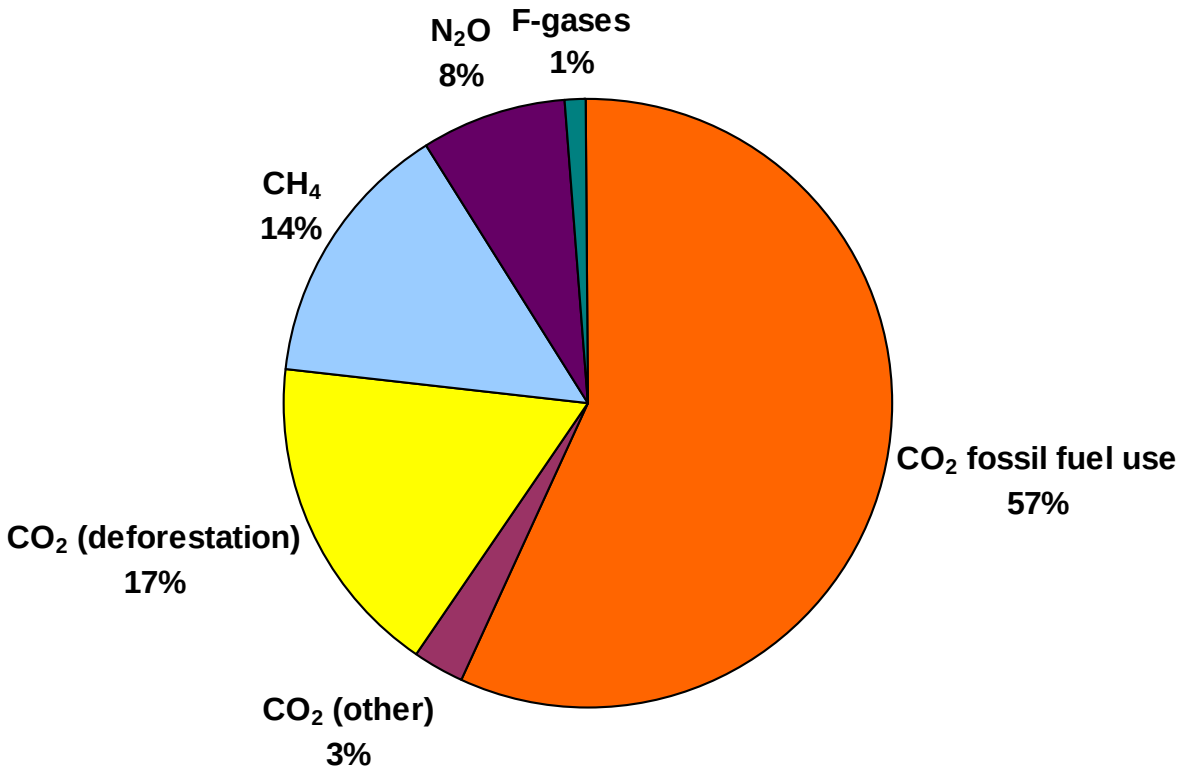
- **EU-OPEC Roundtable on CCS, Riyadh, Saudi Arabia, 21st September 2006**

IPCC 4th Assessment Report



- Warming of the climate system is “unequivocal”
- Uncertainties remain over the link between GHGs and climate change…
- …but there is “very high confidence” that the net effect of human activities since 1750 has been one of warming

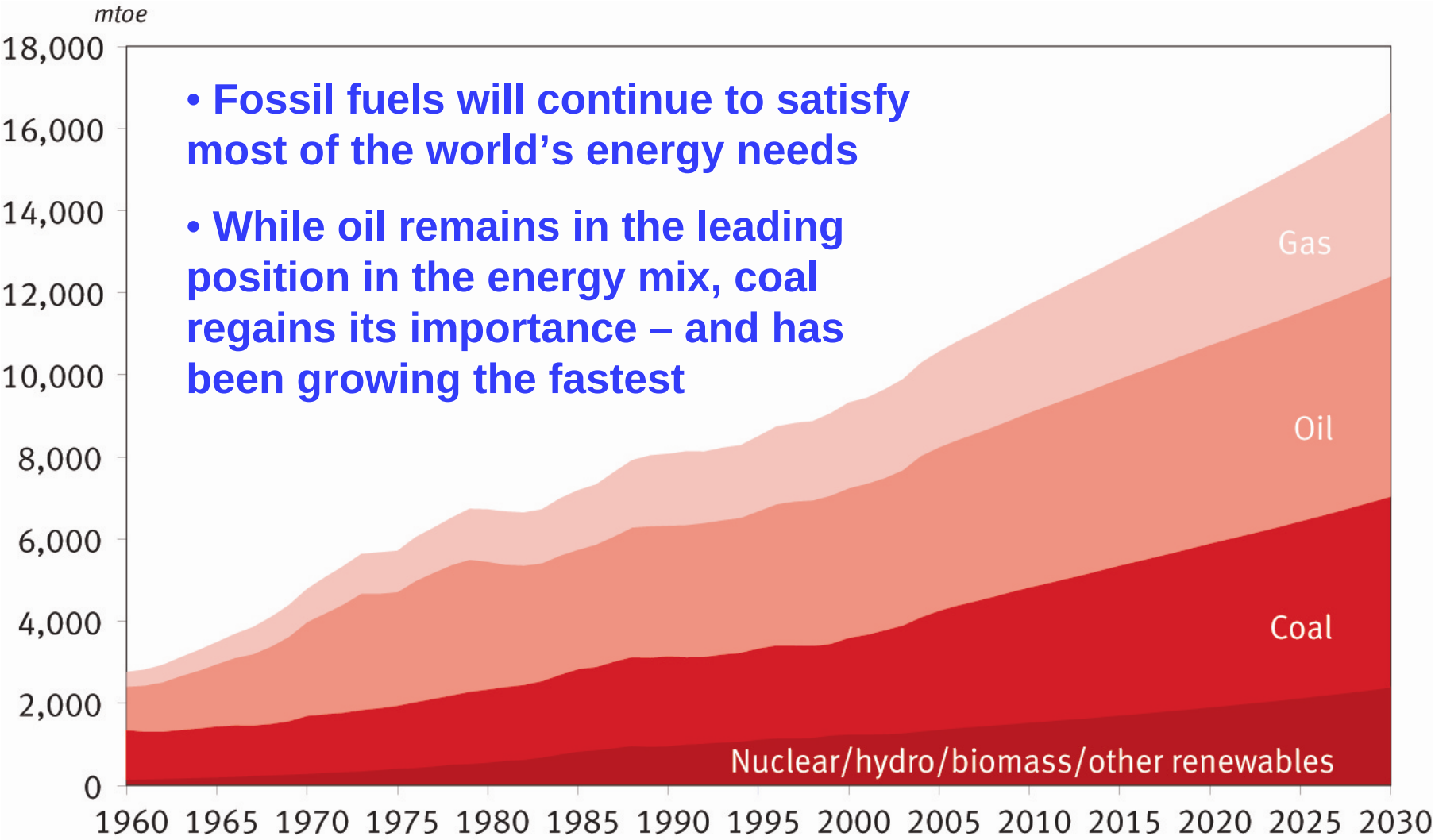
Global anthropogenic GHG emissions



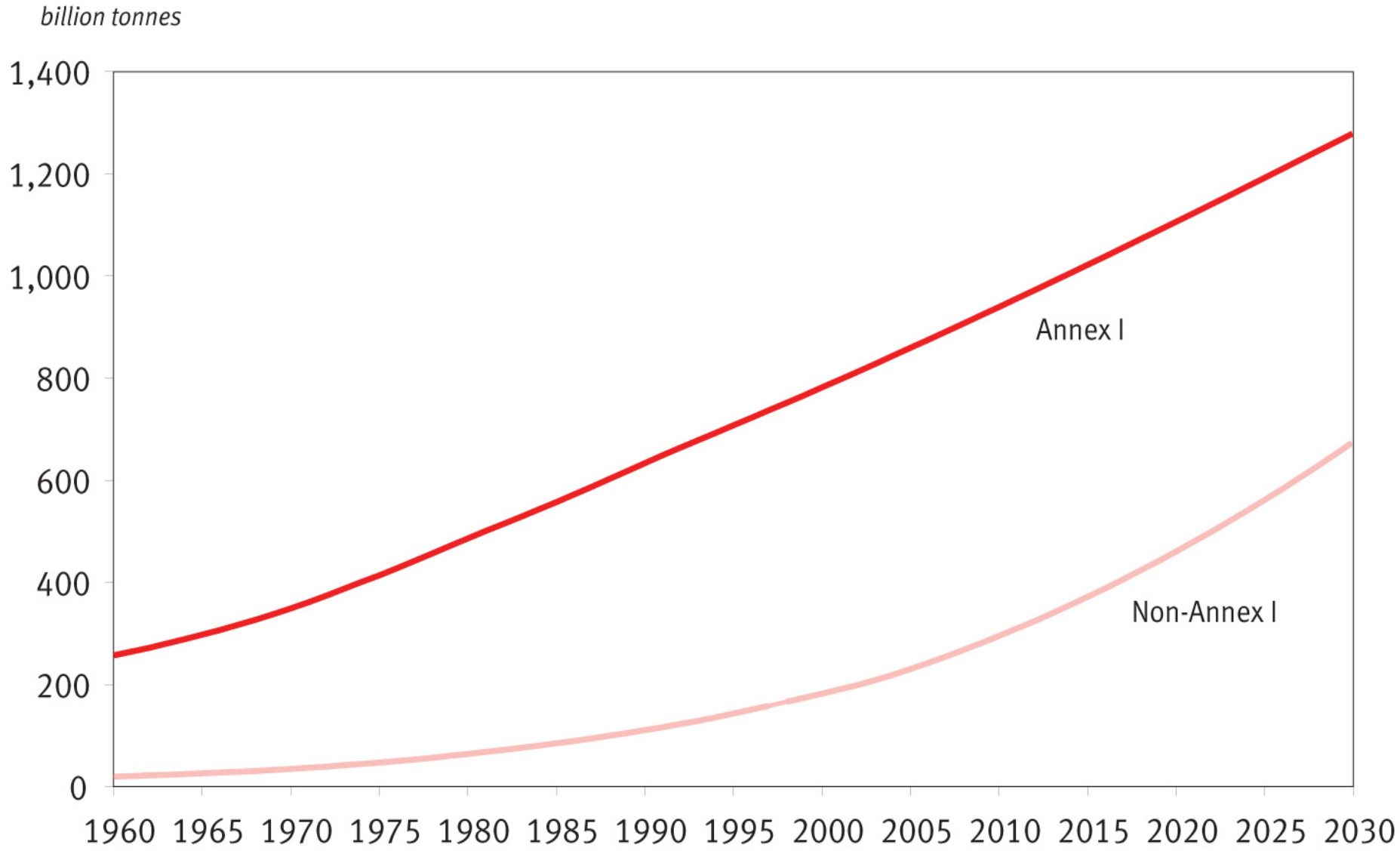
Source: IPCC Fourth Assessment Report 2007

- **43% of anthropogenic GHG emissions are from sources other than CO_2 from fossil fuel use**

Energy demand is set to grow



Cumulative CO_2 emissions from 1900

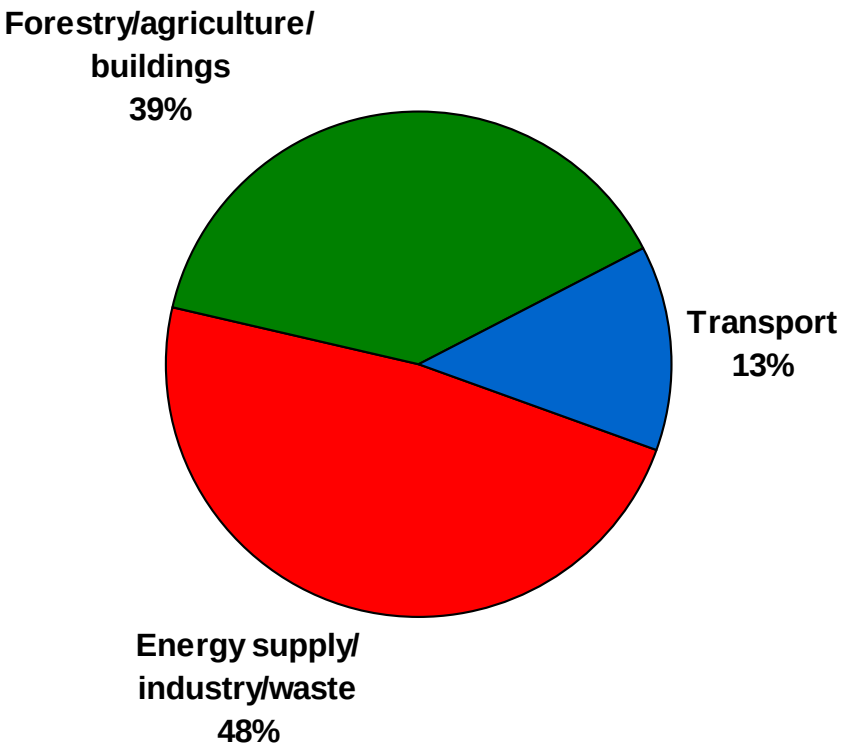


No silver bullet...but CCS is a key technology

- All possible tools are needed to adapt to a carbon-constrained future: there is no silver bullet…
- IPCC Special Report on CCS:
  - by 2100, economic potential is 200-2,000 gigatons
  - equivalent to 15-55% of CO_2 mitigation effort needed to stabilise concentrations
  - By 2050, 20-40% of emission from fuels suitable for capture
- CO2-enhanced oil recovery a “win-win” opportunity

Stationary sources of CO_2 emissions are key

Global anthropogenic GHG emissions



Source: IPCC Fourth Assessment Report 2007

Worldwide large stationary CO_2 sources

Process	Mt CO_2/year
Power	10539
Cement	932
Refineries	798
Iron/steel	646

Source: IPCC Special Report on Carbon Dioxide Capture and Storage, 2005

- **Close to half of anthropogenic GHG emissions are from stationary sources such as electricity generation**

Challenges facing CCS

- Costs are still high
- Who will pay for it?
- Legal issues
- Public acceptance

CCS costs need to be lowered

Type of power plant with CCS	Natural Gas Combined Cycle reference plant US$/tCO$_2$ avoided	Pulverized Coal reference plant US$/tCO$_2$ avoided
Power plant with capture and geological storage		
Natural Gas Combined Cycle	40 - 90	20 - 60
Pulverized Coal	70 - 270	30 - 70
Integrated Gasification Combined Cycle	40 - 220	20 - 70
Power plant with capture and EOR[17]		
Natural Gas Combined Cycle	20 - 70	0 - 30
Pulverized Coal	50 - 240	10 - 40
Integrated Gasification Combined Cycle	20 - 190	0 - 40

- CO_2 capture: highest component of cost; power plant efficiency reduced by 6-11 percentage points
- CO2 transport by pipeline: mature technology
- Storage: safety more of an issue than cost.
- With more R&D&D activities, costs could be significantly reduced

Source: IPCC, SPM, SRCCS, 2006

Who will pay for it?

- Ensure financing is by developed countries
- Role of public finance
- Private sector involvement
- Public/private partnerships
- Possible role of the CDM

Legal and Regulatory Frameworks for CCS

- **Development of legal and regulatory frameworks is required, in particular for:**
  - Permitting
  - Monitoring and verification
  - Site closure
  - Short- and long-term liability
  - Remediation

- **Policies are also needed to:**
  - Remove unwarranted barriers to CCS
  - Create incentives for CCS projects

Public Awareness

- **Responding to public concerns is key in ensuring acceptance of CCS**
- **Leakage: disseminate information about leakage risks**
  - IPCC: Fraction retained in appropriately selected and managed geological reservoirs is very likely* to exceed 99% over 100 years, and is likely** to exceed 99% over 1,000 years
- **Development of regulations: inclusive and transparent process**
- **Impacts on electricity costs**
- **Build trust through more demonstration projects**

* "Very likely" is a probability between 90 and 99%. ** “Likely” is a probability between 60 and 90%.

Conclusion

- CCS is a key mitigation technology
- Challenges ahead…
- …but there are business opportunities
- Scale: potentially huge new industry

Thank you