Climate Change Mitigation

The Working Group III contribution to the IPCC Third Assessment Report

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WMO

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)

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Structure of TAR WG III on Mitigation

- Climate change mitigation in context of sustainable development (Ch1)
- Long term stabilisation strategies (Ch2)
- Short/medium term technological/ biological mitigation options, barriers/ opportunities and policy instruments (Ch 3-6)
- Cost of mitigation and ancillary benefits/costs (Ch7-9)
- Decision making frameworks (Ch 10)
- Gaps in knowledge (SPM+TS)

The context

- Climate change is not just an environmental issue, but a development issue
- There is a strong link between sustainable development and climate change mitigation

- Relevant international policies (structural adjustment, etc)
- Human and social capital
- Technological, social, economic and institutional infrastructure
- Incentives for innovation towards environmentally sound technology
- Privatization of energy markets
- Clean air, forest preservation, energy security

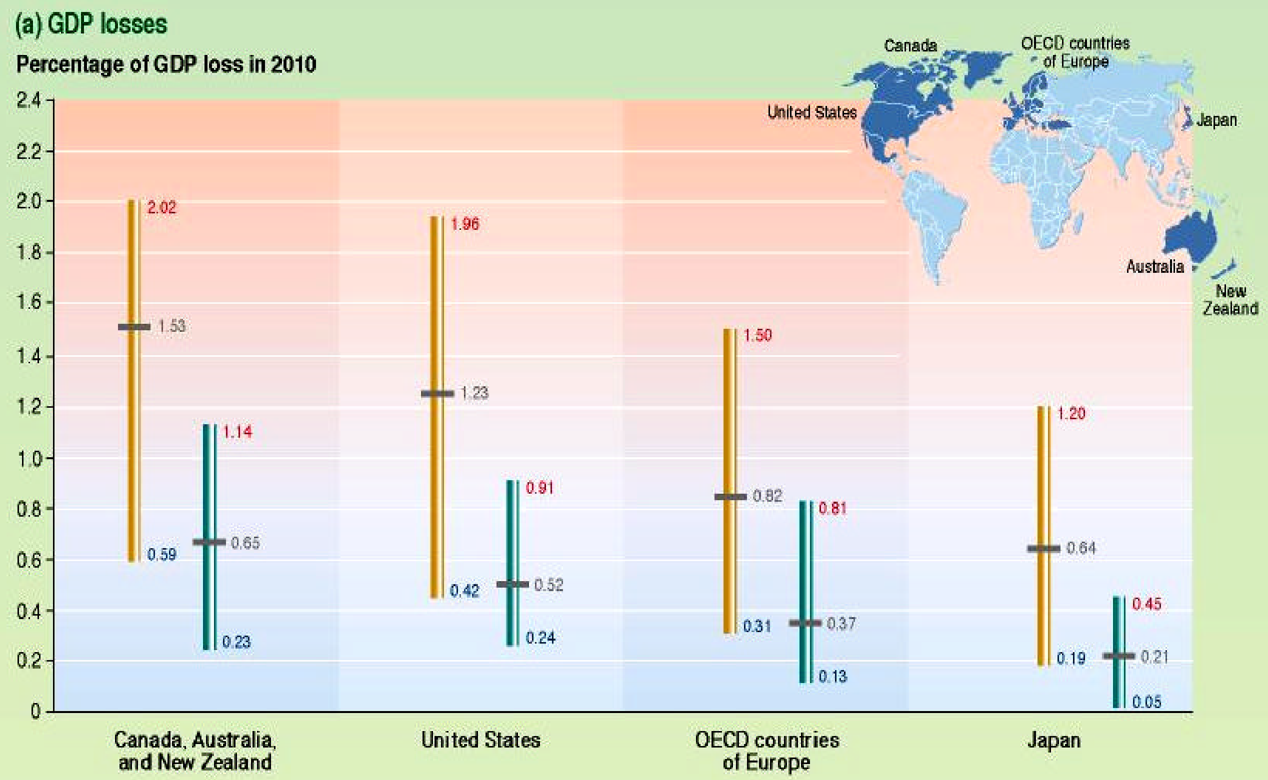
SUSTAINABLE DEVELOPMENT ⇄ CLIMATE CHANGE MITIGATION

- Avoided climate change impacts
- Costs and distribution of costs, including spill-over
- Ancillary benefits (air quality, forest preservation, energy security)
- Impacts of hydro-power on ecosystems
- Impacts of C sequestration on food/fiber availability
- Economic impacts of international climate change regimes

Costs of implementing Kyoto Protocol for industrialised countries

- Not counting avoided climate change
- Macro-economic modelling studies: 0.1-1.1% of 2010 GDP with efficient use of KP mechanisms (0.2-2% without) (reduced annual growth %: 0.1-0.2%/yr) (without USA much lower)
- Costs can be even lower with efficient use of sinks, other GHG's, CDM and domestic implementation and when including ancillary benefits or market imperfections domestic implementation
- Models under-estimate costs because they assume emissions trading without transaction costs, and optimal, ***depending on assumptions***; some winners and some losers
- National cost estimates vary more widely

Projections of GDP losses and marginal cost in Annex II countries in 2010 from global models



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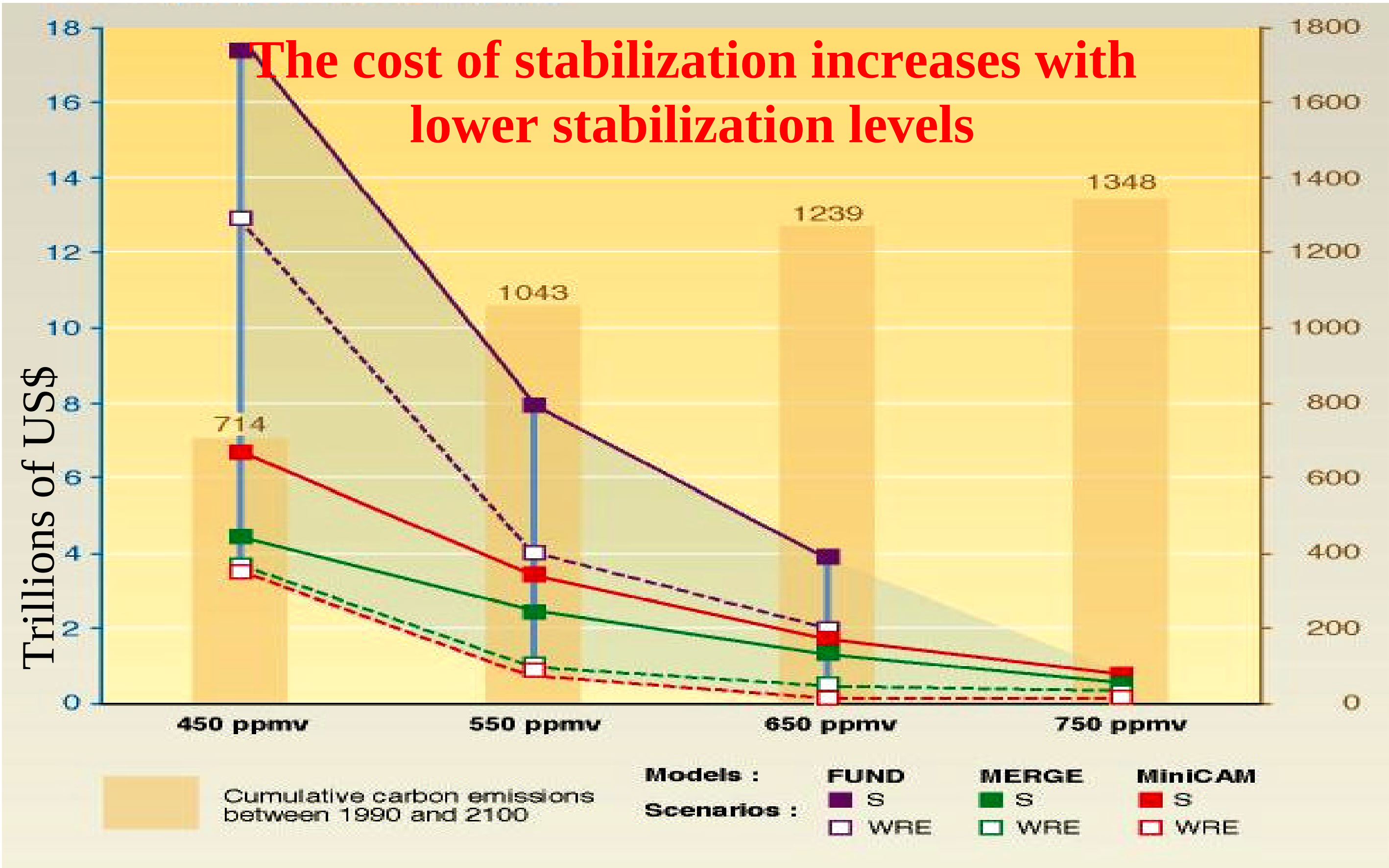
Costs of climate change mitigation for developing countries

- Implementing KP by industrialised countries: slight losses to slight benefits due to changes in terms of trade, changes in costs of energy imports, relocation of industries (large differences between models, due to assumptions)
- Oil exporting developing countries: due to KP implementation: 0.05-0.2% reduction in 2010 GDP, but can be substantial reduction (up to 13-25%) in projected oil revenues
- Long term costs: depending on international regime (and capital transfers) , development path and stabilisation level; if done optimally costs will not be excessive

The cost of stabilization increases with lower stabilization levels



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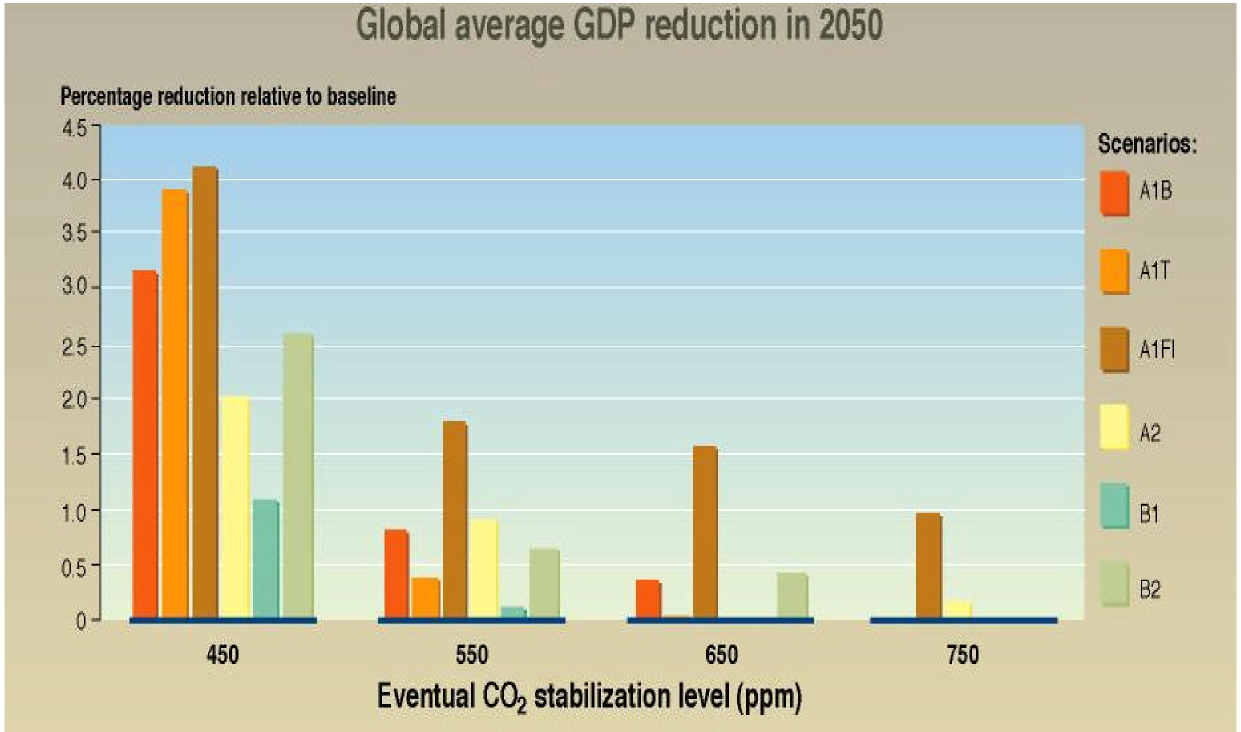
Projected mitigation costs are sensitive to the assumed emissions baseline



Climate change decision making

- Dealing with uncertainties: stabilisation level, risk of climate change, mitigation, adaptation >> ***risk management***
- Sequential process: put short term decisions in long term context; choose optimal timing, be aware of inertia
- Inertia and uncertainty imply safety margins in setting strategies, targets, timetables for avoiding “dangerous interference”.
- Pervasiveness of inertia and possible irreversible changes are major reasons for anticipatory adaptation and mitigation; a number of adaptation and mitigation options may be lost if action is delayed

How WG III dealt with uncertainties

- Different from WG I/ II, because engineering/ economics rather than natural science approach
- Use of different scenarios/ baselines
- Specify assumptions of (model) calculations and look at different modelling approaches
- Present outcomes as ranges rather than as specific numbers

Critical gaps in knowledge

- Regional, country and sector specific potentials of technological and social innovation options
- Economic, social and institutional issues related to climate change mitigation in all countries
- Methodologies for analysis of the potential of mitigation options and their cost, with special attention to comparability of results
- Evaluating climate mitigation options in the context of development, sustainability and equity

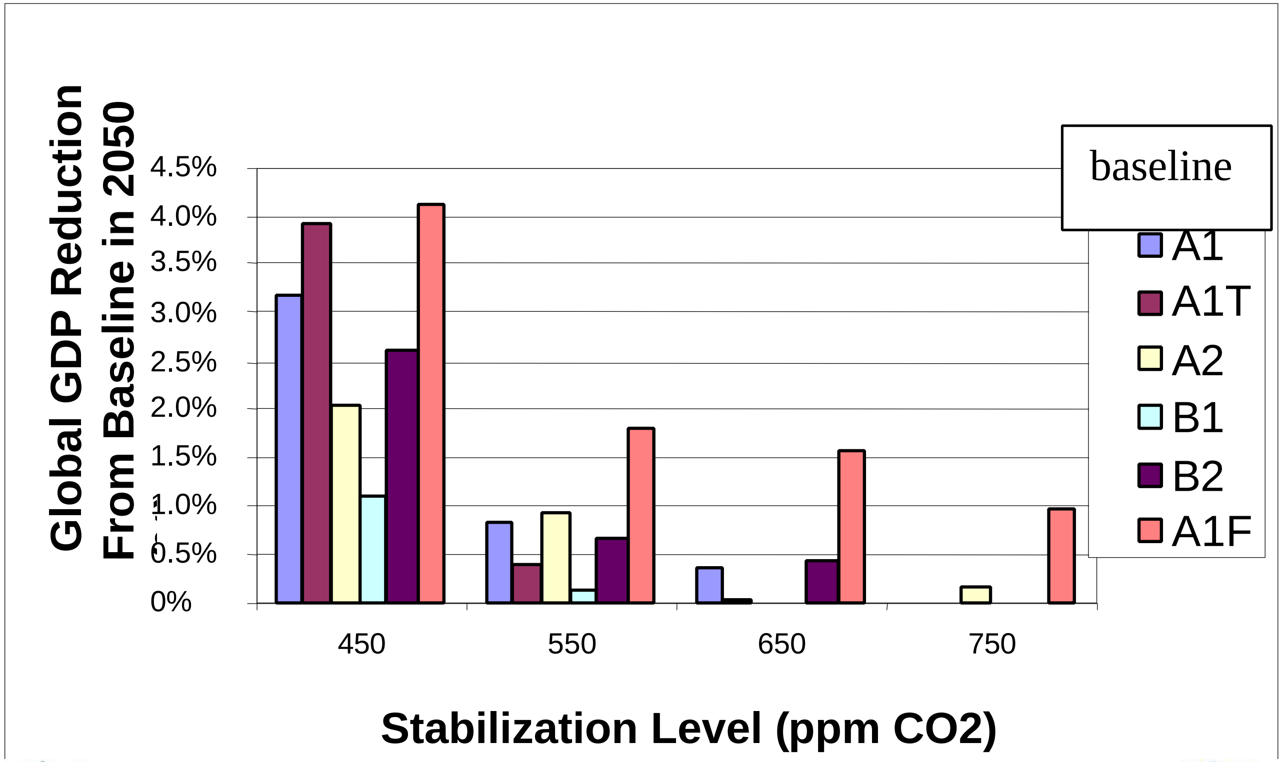
	Later mitigation	*Earlier mitigation*
Technology development	• benefits from autonomous technology improvement	• provides corporate incentives • enhances learning
Capital stock/ inertia	• reduces lock-in to early versions of new technology	• reduces lock-in in existing technologies
Social effects	• allows more time for acceptance of measures and new technologies	• reduces risk of social disruption of later rapid reductions
Discounting/ intergenerational equity	• more favourable at high discount rates	• more favourable at low discount rates
Climate change impacts	• higher damages from rapid rates of change	• lower damages from rapid rates of change • tightening of targets easier to achieve

International cooperation: a global climate change regime

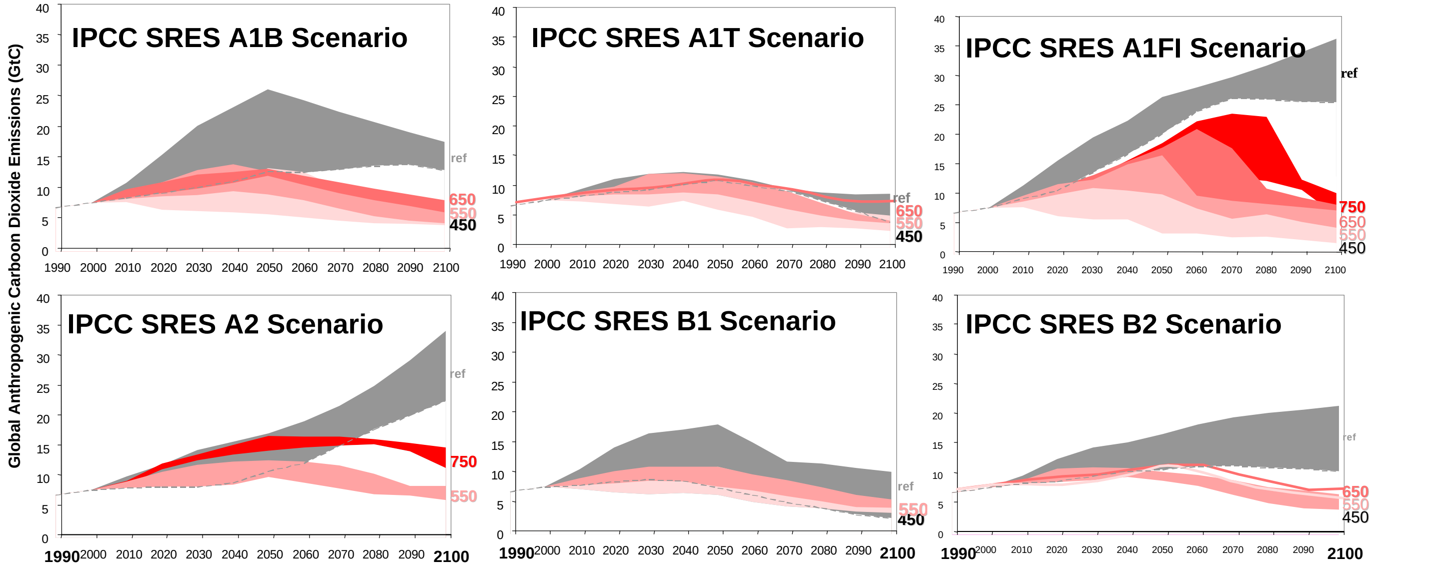
- Equity and efficiency: important and compatible
- Many equity approaches: allocation, outcome, process, rights, liability, poverty, opportunity
- Industrialised countries alone cannot solve the problem
- Developing countries need to contribute to emission reductions (later and less if development is sustainable)

Costs of stabilisation

Source: Hourcade et al, 2001



The stabilisation challenge depends on the reference scenario and the stabilisation level



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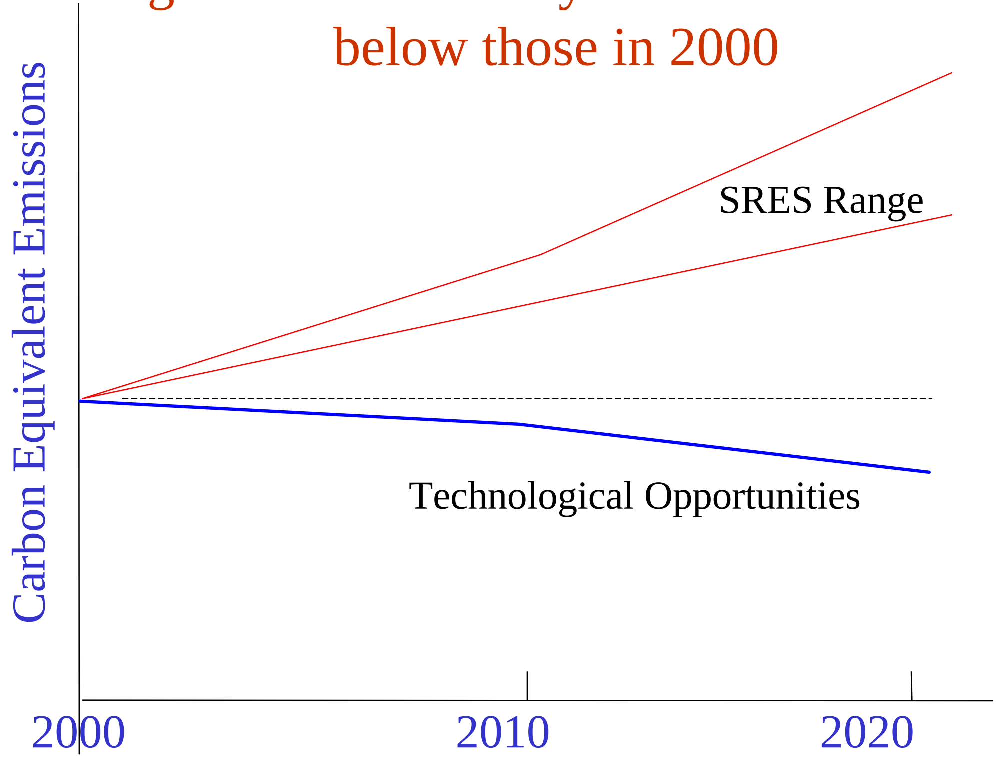
How it fits together in the long term

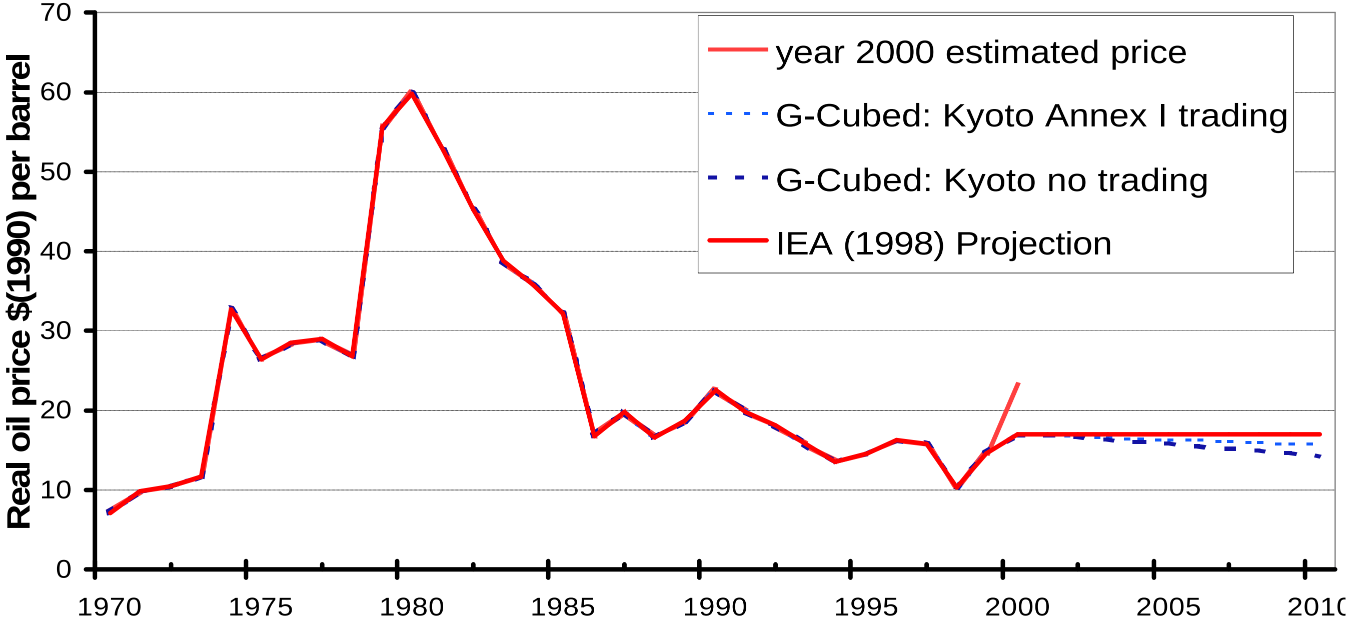
- Technical potential of known technologies adequate for 450 ppm stabilisation or lower; broad package needed
- Lifestyle/ behaviour change would help, but not essential
- Learning makes new technologies attractive over time
- Fossil fuel prices will go up as easy reserves deplete
- Energy efficiency improvement rates within historic range
- Penetration rates are well within historic rates
- Associated socio-economic and institutional changes important
- Technology transfer crucial

Technology improvements have the potential to reduce global emissions by 2010 and 2020 to levels below those in 2000

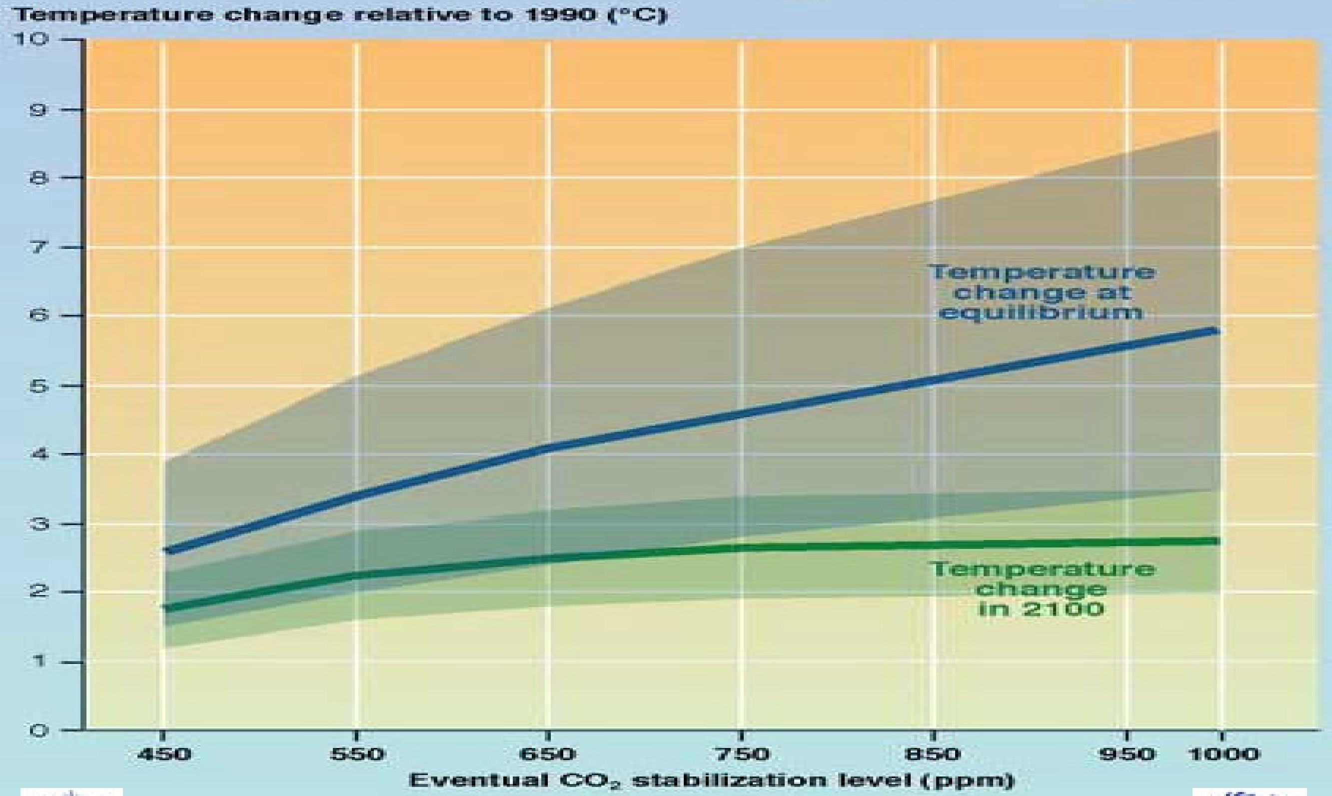


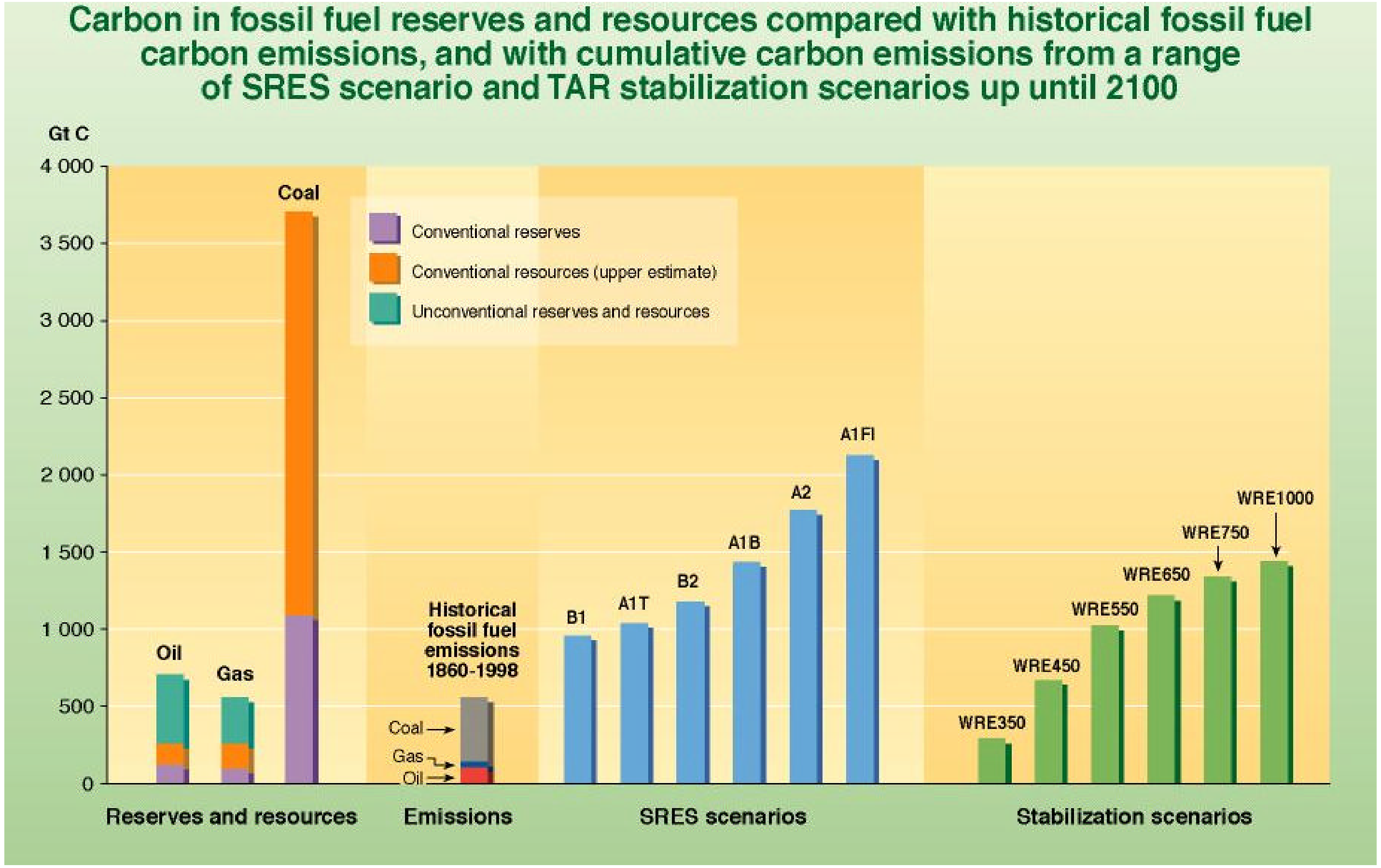
Impact of Kyoto Protocol on oil price

Source: Barker et al, 2001



There is a wide band of uncertainty in the amount of warming that would result from any stabilized concentration of greenhouse gases




Carbon in fossil fuel reserves and resources compared with historical fossil fuel carbon emissions, and with cumulative carbon emissions from a range of SRES scenario and TAR stabilization scenarios up until 2100
Gt C
4 000
3 500
3 000
2 500
2 000
1 500
1 000
500
0
Coal
Oil
Gas
Conventional reserves
Conventional resources (upper estimate)
Unconventional reserves and resources
Historical fossil fuel emissions 1860-1998
Coal
Gas
Oil
B1
A1T
B2
A1B
A2
A1FI
WRE350
WRE450
WRE550
WRE650
WRE750
WRE1000
Reserves and resources
Emissions
SRES scenarios
Stabilization scenarios