

# The Economics of Climate Change

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## Outline

1. What should the global climate-change target be?
2. Targets, prices, taxes and trading – how governments are designing policy
3. 'Shadow' prices and regulatory impact assessment – trying to reduce emissions cheaply

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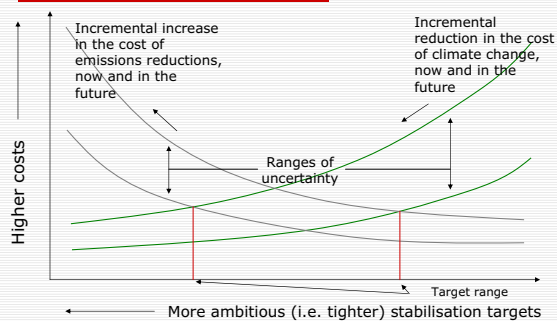
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## What should the global climate-change target be?



## The basic logic of 'stabilisation'



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## 'Probabilities' of temperature increase

Stabilisation level (in ppm CO <sub>2</sub> e)	2°C	3°C	4°C	5°C	6°C	7°C
450	78	18	3	1	0	0
500	96	44	11	3	1	0
550	99	69	24	7	2	1
650	100	94	58	24	9	4
750	100	99	82	47	22	9

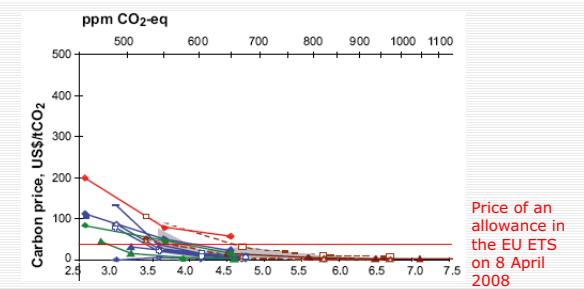
Source: Hadley Centre (Murphy *et al.*, 2004)

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## The cost of stabilisation



Source: IPCC (2007)

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## So what target are we aiming for?

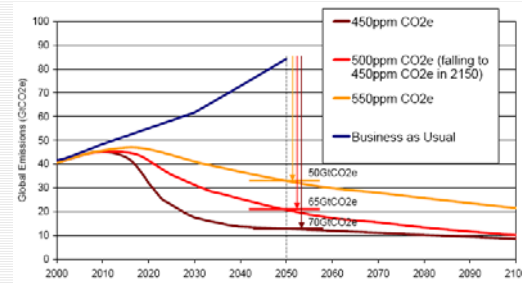
- 5°C warming or more would transform the natural environment; it is unprecedented in human history
- On basis of implied probabilities of temperature increase, it is therefore dangerous to go beyond 550 ppm CO<sub>2</sub>e
- Stabilisation at 550 or even 500 ppm CO<sub>2</sub>e 'buys' a sharp reduction in the implied probability of dangerous warming
- Cost of action to get in range 500-550 looks acceptable relative to potential damages avoided
- But even 500 still implies possibly significant warming. This could justify 450 ppm CO<sub>2</sub>e, although this looks costly to achieve without overshooting

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## Achieving 450-550: big cuts are required

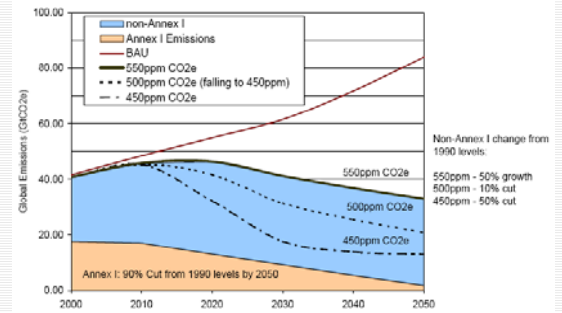


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## All countries will have to cut emissions



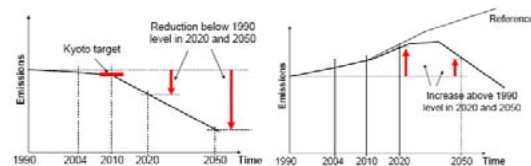
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## Common but differentiated responsibilities

Source: Ecofys (2007)



- Country on the left is industrialised (e.g. UK or USA); country on the right is developing (e.g. China)
- Many methods proposed for sharing the burden, but the differences are small. The overall target matters more

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## Where do we seem to be heading? Growing momentum

- UN Framework Convention on Climate Change (UNFCCC)
- Kyoto Protocol (to the UNFCCC)
- Growing momentum
  - Heiligendamm G8 meeting - explicit mention of 50% cut by 2050, ~ stabilisation at 500 ppm
  - California (and US under e.g. Obama/Clinton): 80% cut in total greenhouse gas emissions by 2050
  - France: 75% cut by 2050
  - EU Spring Council 2007: 60-80% cut by 2050 with 20-30% by 2020
  - Japan: proposals for a 50% cut by 2050

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## Targets, prices, taxes and trading

## Preliminaries: Kyoto and all that

- UN Framework Convention on Climate Change (UNFCCC)
  - Overall goal of stabilisation to avoid 'dangerous' climate change
  - Principle of 'common but differentiated responsibilities'
- Kyoto Protocol (to the UNFCCC)
  - Modest targets to reduce national emissions by 2012 in so-called 'Annex I' countries
  - Introduced flexible mechanisms to meet these targets
    - International Emissions Trading
    - Clean Development Mechanism/Joint Implementation
- Up to each country to decide how to meet its target, using these flexible mechanisms and other policies
  - EU opted for firm-level emissions trading

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## The EU emissions trading scheme

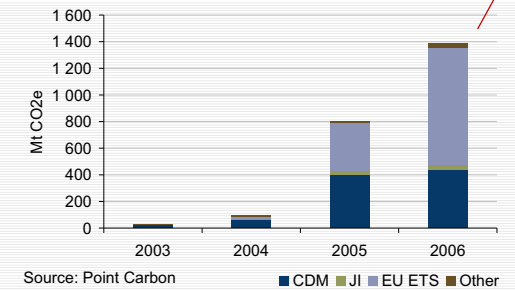
- Emissions of sulphur and nitrous oxide have been traded in the US since 1995
  - This was a big success – the costs of compliance with US emissions quotas fell 50%
- The EU ETS is the world's first and still largest firm-level international scheme to trade carbon
- Firms can buy emission reductions in emerging economies (more on this shortly)
- Has created a major new market opportunity in financial services

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## The carbon market is growing strongly

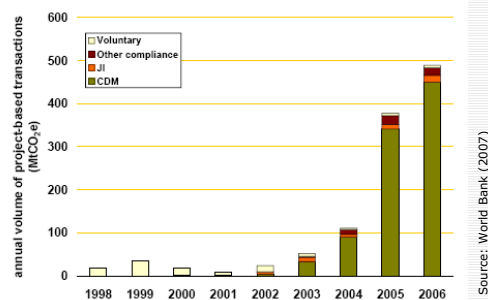


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## And thanks to the 'CDM' it is not limited to the EU

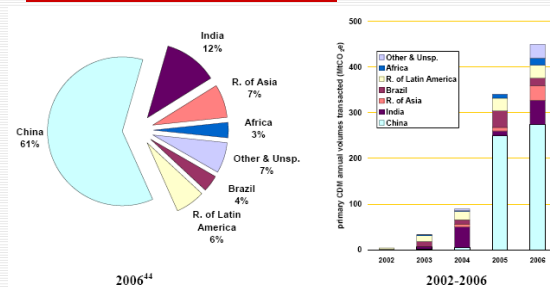


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## Who is selling? China is the major player in the CDM



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## Not to mention the market for 'offsets'

Help the environment by offsetting your carbon emissions

FLY greener

The amount of carbon dioxide emissions attributable to your journey is shown below.

By offsetting your emissions you will be funding worthwhile and credible projects that reduce emissions on your behalf.

Payment can be made either by credit card or by debiting your Asia Miles. All present payments (other than those using Asia Miles) can only be made in Hong Kong dollars.

Destination	Trg	Passengers	Cabin Class	CO2 Emissions	Equivalent
London	Round Trip	1	Business	2,43 tonnes	HKD 194.17 or £ 4,541
Hong Kong	Trg				
<b>Total</b>				<b>2,43 tonnes</b>	<b>HKD 194.17 or £ 4,541</b>

Total Contribution: HKD 194.17 (Guaranteed)

or 4,541

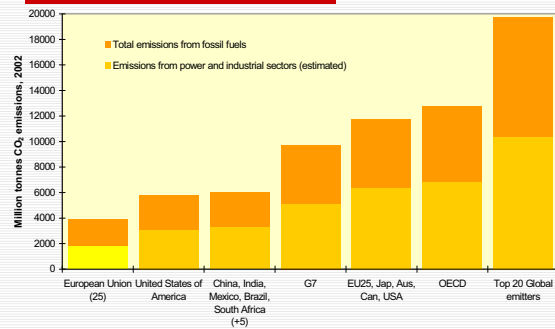
Terms and Conditions: I agree to the Terms and Conditions associated with FLY greener offset programme of Cathay Pacific Airways.

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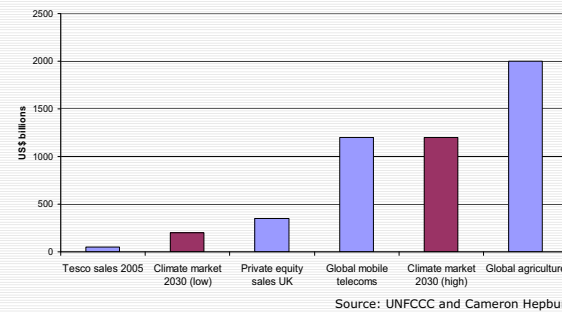
## What we see today is the 'tip of the iceberg'



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## So the carbon market has huge potential



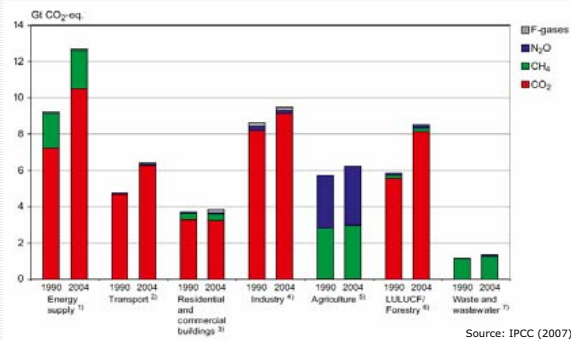
Source: UNFCCC and Cameron Hepburn

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## 'Shadow' prices and regulatory impact assessment: trying to reduce emissions cheaply

## Reducing emissions requires action across many sectors

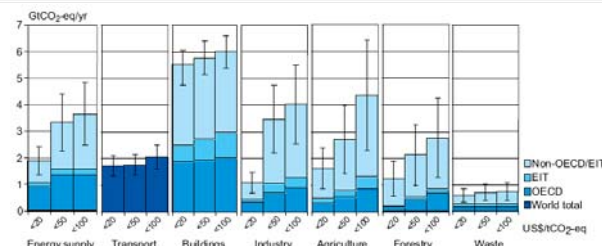


Source: IPCC (2007)

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## All sectors and regions have 'mitigation potential'



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## The UK 'shadow price of carbon'

- Problem: all government policies, plans, programmes and projects produce greenhouse gas emissions
- To reduce emissions at the lowest cost, action should be targeted where it is cheapest
- Solution 1: micro-manage
  - Experience tells us this is difficult
- Solution 2: set a price on carbon, include it in a cost-benefit analysis of all policies, plans, programmes and projects
  - Hence the new UK shadow price of carbon – all emissions from all policies etc. should be priced at roughly 50 US\$/tCO2

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