

The Economics of Climate Change

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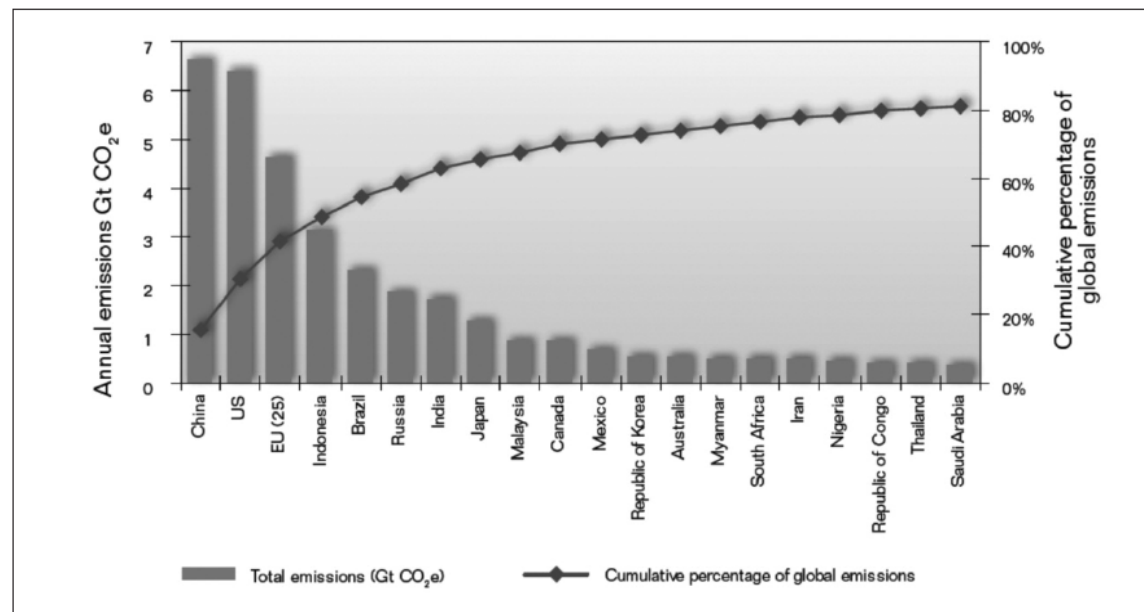
Four Part Structure

- Section 1: Risks.
- Section 2: Economics for policy.
- Section 3: Current position and where we need to be.
- Section 4: An ambitious global deal and EU leadership.

From people to emissions

- The combined effects of growth, industrialisation and hydrocarbon use substantially increased flows of greenhouse gas emissions: thus concentrations of stocks have grown from 285ppm in the mid 19th-century to over 430ppm CO₂e today.

Emissions by country

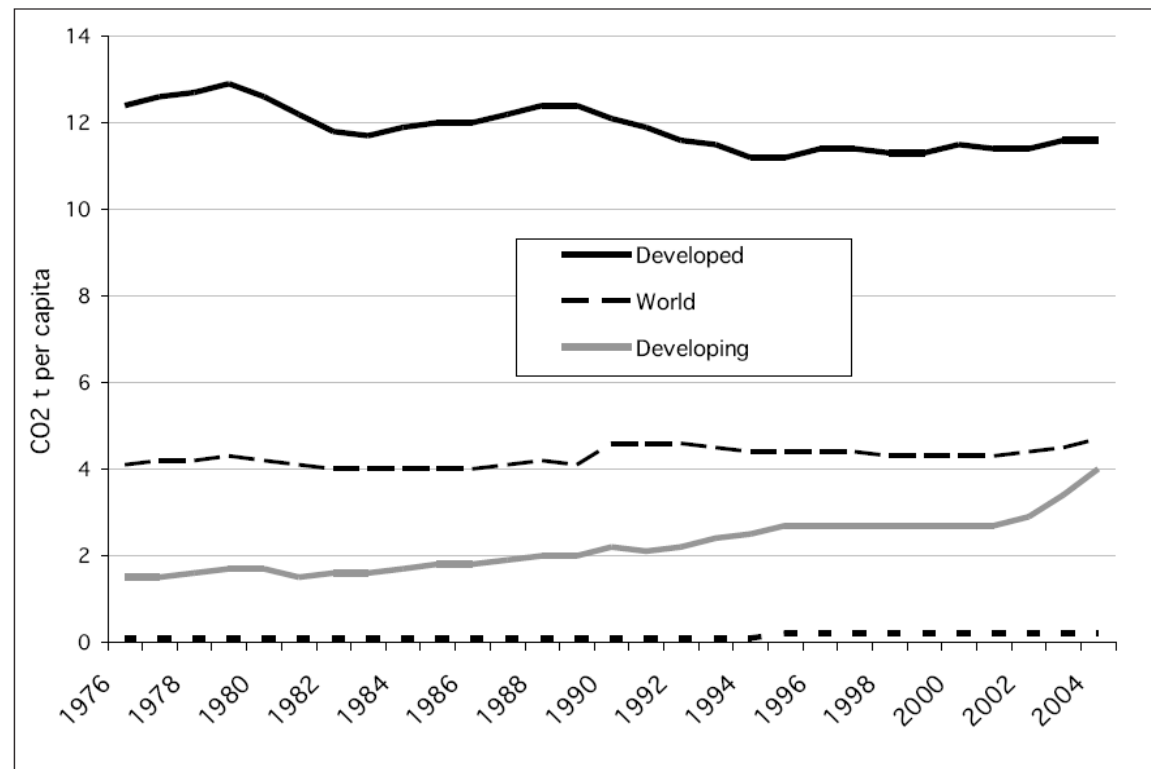


Source: Garnaut (2008), UNFCCC (2007) 2004 data for US, EU (25), Russia, Japan and Canada; Department of Climate Change (2008) 2004 data for Australia (using UNFCCC accounting); and World Resources Institute (2008) for other countries (2000 data except for CO₂ emissions from fossil fuels, which is for 2004).

From people to emissions

CO₂ emissions per capita (1976–2004)⁶

- Over the next 20 years developing countries will play an increasing role in driving growth in overall emissions.
- Per capita emissions for rich countries are much higher.



Source: Climate Analysis Indicators Tool (CAIT)

From stocks to temperature

Stabilisation level (in ppm CO ₂ 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

Extrapolations from Murphy et al. 2004

Source: Meinshausen 2006; Murphy et al. 2004; calculations.

- We are already over 430ppm CO₂e, and are adding at a rate of over 2.5ppm per year (likely to accelerate with little or weak action). BAU will take us over 750ppm by the end of the century.
- This level of concentration would result in a large probability, around 50% or more, of an eventual temperature increase of more than 5°C compared with the pre-industrial era. This would be enormously destructive.
- Physical and human geography would be transformed. The planet has not seen such temperatures for 30 million years. Potential cause of migration of billions of people around the world.

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Economics for policy

- Risks and ethics:
 - Emphasis on risk management rather than formal modelling for cost-benefit analysis.
 - Both ethics and risk crucial; cannot leave out either.
- Market failures:
 - Must start with but move beyond the climate change externality.
 - Confidence in policy, R&D, market failure (property/capital) and behaviour.

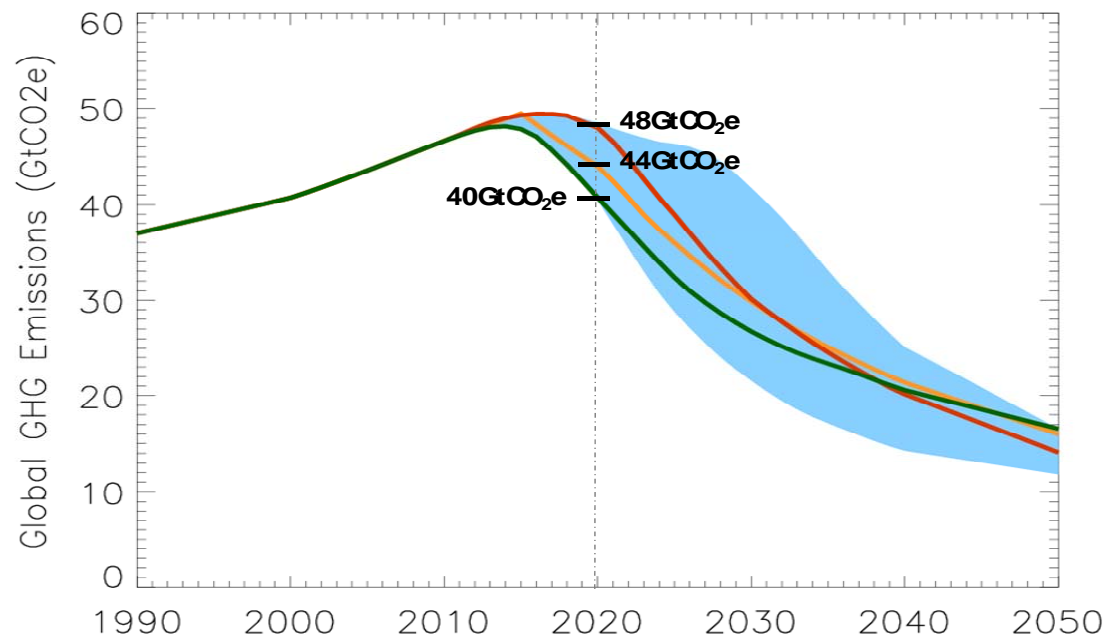
Economics for policy

- Why markets can't tell us the relevant rates for discounting.
 - Endogeneity of future consumption: discount rates depend on policy.
 - What long-run markets exist?
 - Rate of interest on long-run markets that do exist: real 'risk-free' consumption rates around 1.5%.
 - Failure of capital markets: there are many rates of return and interest rates.
 - Change in relative prices between consumption and environmental goods: if environment is 'numeraire', discount rates could be negative.

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What our targets should be



- Holding below 500ppm CO₂e, and reducing from there, is necessary to give a reasonable chance of staying below 2 degrees. This requires bringing emissions down to below **20Gt CO₂e** (approx. 50% of 1990 levels) by 2050. Would reduce the risk of a 5°C increase to less than a 5% probability.
- A range of trajectories is possible – later peak years require stronger action later on.
- As global population likely to be around 9 billion in 2050, these simple headline numbers imply average emissions around **2 tonnes per person**.
- Cannot afford any delays: a delay of 10 years in initiating action would be likely to increase the ‘starting concentration’ from around 435ppm CO₂e to over 465ppm CO₂e, making required deductions more costly or impossible.
- This presentation examines trajectories with around **47Gt** CO₂e in 2010 (reduced by slowdown – might have been 50), **44Gt** in 2020, **under 35Gt** in 2030 and **under 20Gt** in 2050. Likely to have to go ‘**well under**’.

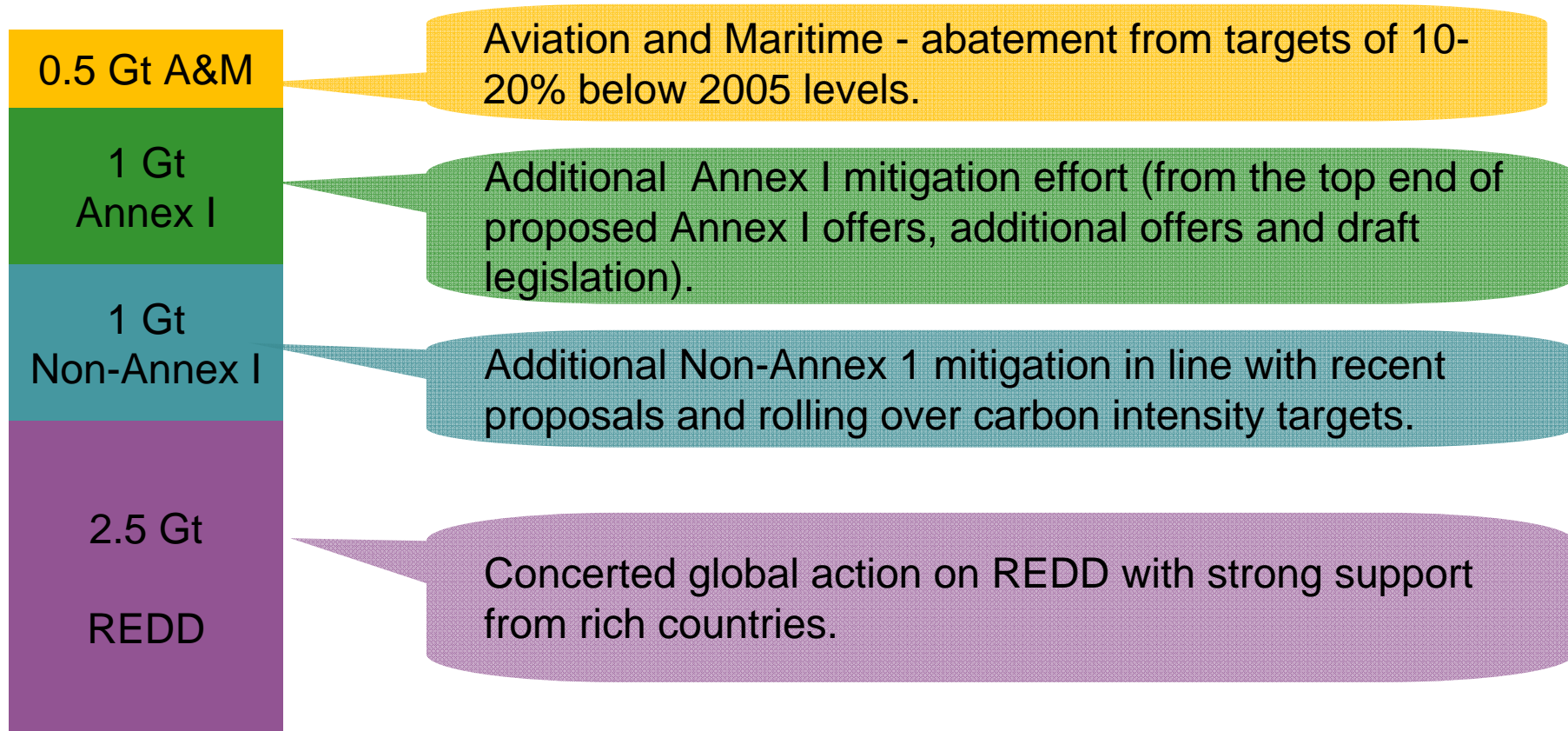
Current 'intentions' for 2020

	Policy, intention or target	2020 Emissions (Gt CO ₂ e)
US	1990 levels	6.1
EU	-20% on 1990	4.5
Japan	-25% on 1990	1.0
Other developed countries	Current intentions	4.9
Developed country total		16.4
China	2010 intensity target; 2020 renewable and nuclear target (1.3 Gt saving)	11.2
India	2020 solar mission, renewable target, 2017 forestry target (0.2 Gt saving)	3.6
Other developing countries	Business as usual	18
Developing countries total		32.8
Global total		49.2

- **Current intentions and policies imply overall emission around 49Gt in 2020.**
- **This is a saving on business as usual of 6-11Gt.**
- **It leaves a gap of around 5Gt.**
- **This does not include forestry intentions other than India**

Options for filling a 5Gt gap

- An example of how to close the gap.
- There are a number of alternative options - more progress in one area would mean less in another.



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An ambitious global deal

A deal must be effective, efficient and equitable. A deal that fails on one or more of these fundamental principles will not be sustainable.

- **Effectiveness** – it must lead to the necessary cuts in emissions of greenhouse gases;
- **Efficiency** – it must be implemented in a cost-effective way, with mitigation focussed where and when it is cheaper; and
- **Equity** – it must take account of the fact that it is poor countries that will be hit earliest and hardest; further, rich countries have greater wealth, more technology and a particular responsibility for the cause of the problems through their past emissions. Equity requires strong reduction targets in rich countries, significant funding for mitigation and adaptation, and sharing of technologies.

An ambitious global deal – broad picture

- Six key numbers

~ 50Gt	<35Gt	<20Gt	>80%	US\$100bn	US\$100bn
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- Global emissions - around 50Gt in 2010; under 35Gt in 2030; under 20Gt in 2050. Likely to have to go well under these figures for 2030 and 2050.
- Agreement must be based on the foundations laid out in the “Bali Roadmap”.
- The developed world must lead with strong and credible commitments in 2020 and 2030 towards a reduction of at least 80% by 2050. This would bring Europe close to the 2 tonnes per capita world average required by 2050.
- The developing world will be 8 out of the 9 billion people in 2050 – they must be centrally involved. Even if rich countries were zero, their average could not exceed 2.5 tonnes per capita. Strong climate change action plans are crucial.
- Developing world should “**commit to commit**” to targets within 5-10 years based on strong performance by the developed world over the next decade on reductions, finance and sharing technology.

An ambitious global deal – key detail

- Developing country support conditional on finance for climate change action plans. Rich countries to provide support and scale up over time, with additional support contingent on progress.
- Commitments for 2015:
 - Firm and quantifiable commitments for 2015 to provide near-term credible support for climate change action plans.
 - \$50bn commitment (some through the markets) by 2015 (0.1% of rich country GDP); \$15bn deforestation; \$15-20bn Africa mitigation and adaptation; remainder for mitigation outside Africa.
 - As total adaptation and mitigation costs are likely to be much higher than these numbers (HDR estimate \$86bn for adaptation alone in 2015), self-financing will also be substantial.
- Commitments for 2020 and going forward:
 - Commitments to increase finance beyond 2015 to world figures of around \$100bn in adaptation and mitigation funding by 2020.
 - Intention for at least \$200bn in 2020s as the world moves forward to a low-carbon economy (\$100bn for mitigation (some through markets) and \$100bn for adaptation).
 - This build-up in support contingent on strong progress in climate change action plans.
- Finance mostly delivered through international institutions, e.g., new African Development Bank soft window (possibly also World Bank).

An ambitious global deal – key detail

- **Within overall framework important further detailed work necessary including:**
 - Rich country 2020 targets.
 - Reform of CDM.
 - Programmes for strong technology policy.
 - Strong action on REDD.

Areas for and benefits of early action

- **Early action**

- Energy efficiency - great scope for energy efficiency improvements across all countries.
- Halting deforestation, particularly in the tropics.
- Low-carbon technologies - Europe a leader, e.g., wind, solar, nuclear. Strong technology policy is essential.

- **Benefits and opportunities.**

- Low-carbon economy will be one of the most exciting and dynamic periods in history; innovation, discovery, investment.
- Low-carbon growth will be more energy secure, cleaner, quieter, safer, more bio-diverse.
- Huge opportunity for private investment. Many large long-term funds seeking opportunities.
- High-carbon growth will kill itself, first on high hydrocarbon prices and, more fundamentally, on the hostile environment it will create.

European leadership

- **Strong progress already being made outside the EU.**
 - Japan: Prime Minister Hatoyama - 25% cut on 1990 by 2050.
 - China: President Hu Jintao - cut emissions intensity by a 'notable' margin in 2020.
 - India: Minister Jairam Ramesh - new initiatives on solar and energy efficiency and work to quantify emission reductions based on current mitigation policies.
 - Brazil: National Plan on Climate Change announced 2008; recently strengthened to 80% cut in deforestation by 2020.
 - Mexico: President Calderon - Mexico will voluntarily cut its GHGs by 50m tonnes a year by 2012.
 - US slow progress but clear Presidential commitment and some signs of movement in Congress.

European leadership

- **Importance of Europe in building global momentum cannot be overstated.**
 - EU seen as a world leader: EU ETS, R&D, renewables, support to developing countries.
 - Leadership in finance could also encourage other countries to commit. Equitable share for Europe of \$50bn in 2015 would be \$15-20bn? Taking into account population, income and emissions reductions.
- **Rising to a more ambitious 30% cut will be catalytic in achieving significant movement from others.**
 - Important to recognise and respond to progress in major parts of the world.
 - The costs of moving to 30% could be lower than envisaged.
 - Confirmation of readiness on 30% target before Copenhagen would encourage key developed and developing countries to raise their offers.
 - Would also provide early signal to investors of higher carbon prices in the EU.
- **Now is the time for strong political leadership at the highest level.**

Additional references

www.lse.ac.uk/grantham

Papers

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