

The Economics of Climate Change

Co-organised by:



An insurance perspective



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Climate change A priority on the action agenda?



8 distinguished economists (incl. 4 Nobel Laureates) on the best ways to address 10 global challenges and advance global welfare with a USD 50bn budget:

Project rating	Challenge	Opportunity
Very Good	1 Diseases	Control of HIV/AIDS
	2 Malnutrition	Providing micro nutrients
	3 Subsidies and Trade	Trade liberalisation
	4 Diseases	Control of malaria
Good	5 Malnutrition	Development of new agricultural technologies
	6 Sanitation & Water	Small-scale water technology for livelihoods
	7 Sanitation & Water	Community-managed water supply and sanitation
	8 Sanitation & Water	Research on water productivity in food production
Fair	9 Government	Lowering the cost of starting a new business
	10 Migration	Lowering barriers to migration for skilled workers
	11 Malnutrition	Improving infant and child nutrition
	12 Malnutrition	Reducing the prevalence of low birth weight
Bad	13 Diseases	Scaled-up basic health services
	14 Malnutrition	Boost worker opportunities for the unskilled
	15 Climate	Optimal carbon tax
	16 Climate	The Kyoto Protocol
	17 Climate	Value-at-risk carbon tax

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"We don't have a lot more time to deal with climate change"
Henry M. Paulson, (former) Chairman, Goldman Sachs

"... it is time to move from denial to action."
Paul Anderson, (form.) Chairman & CEO, Duke Energy

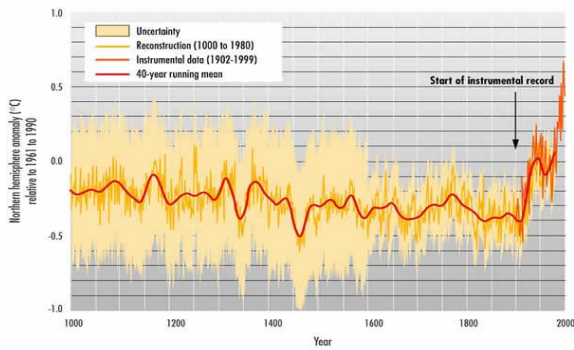
"Climate Change is the number one risk in the world ahead of terrorism, demographic change and other global risk scenarios in my view."

John R. Coomber, MoB and (former) CEO, Swiss Re

"Climate change is perhaps the most challenging collective action problem the world has faced."

Tony Blair, UK Prime Minister

Fact No. 1 Global warming is "unequivocal"

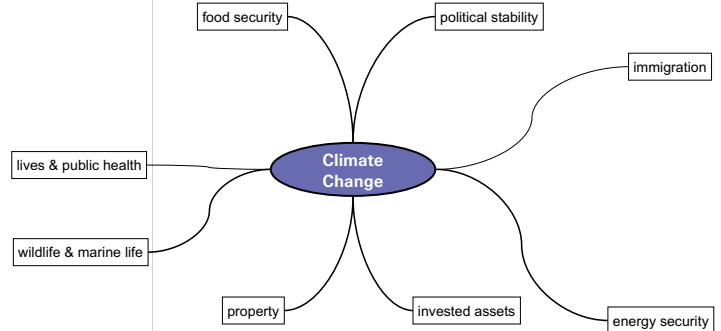


Source: 'Images from The Greenhouse Effect and Climate Change', Australian Bureau of Meteorology, 2005 (copyright Commonwealth of Australia reproduced by permission)

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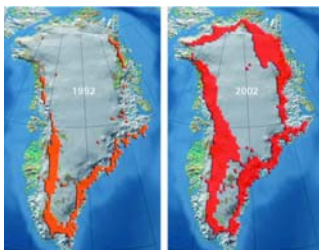
Fact No. 2 Ramifications may be widespread



Fact No. 3: Considerable uncertainty about timing & effect

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- possibility for "run-away" climate change (feedback loops)
- possibility for slow-down of the thermohaline circulation
- possibility for ice shelf disintegration



1992

2002

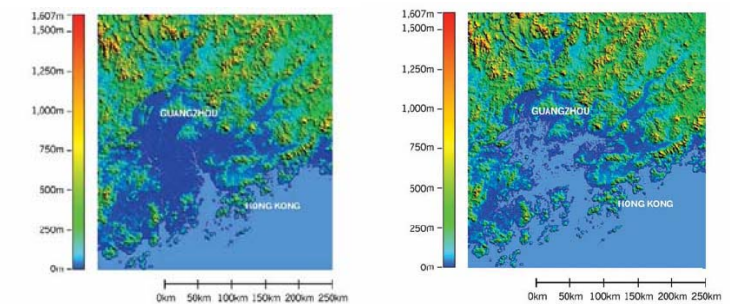
Glacial melt on Greenland: areas in orange & red represent regions of seasonal ice melt during 2 different years, a decade apart.

Source: Arctic Climate Impact Assessment Scientific Report 2004; Image courtesy Prof. K. Steffen, University of Colorado

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If the entire Greenland ice sheet were to melt or disintegrate, sea levels will rise by approx. 6 meters.



Greater PRD at today's mean sea level (light blue represents sea and dark blue represents the most low-lying land) Greater PRD if water level rises 6m: inundation spreads further into Western PRD and around Dongguan; Hong Kong severely affected.

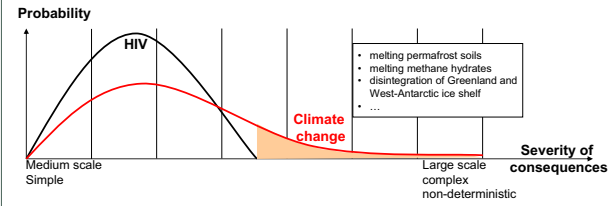
Page 6 Source: Civic Exchange and the HKUST, Institute for the Environment, November 2006

Fact No. 4
The system is inert: "committed warming"

Even if we stopped all CO₂ emissions tomorrow, the planet would continue to warm for another 100 years.



Distribution of possible future outcomes



Effects of HIV/AIDS, malaria

- "normal" distribution
- comparably well defined projects, low level of uncertainty
- apply standard investment decision making tools: 3% discount factor (after inflation), ...

Effects of climate change

- skewed distribution
- high level of uncertainty
- extreme down-side potential
- applying standard investment decision making tools may have its limits
- decision making under uncertainty: the precautionary principle

The precautionary principle

Applying the precautionary principle is best practice:

Why do we purchase property insurance?



Experiences from the past:
unsuccessful



asbestosis

Why does Switzerland have an army?

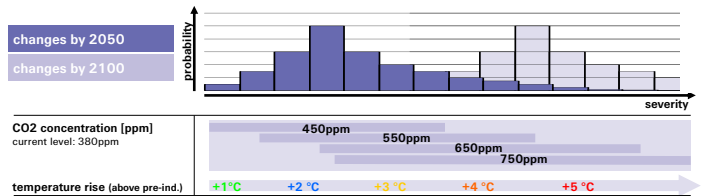


successful

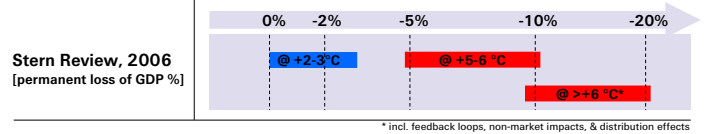


mad-cow disease

Economic effects of climate change



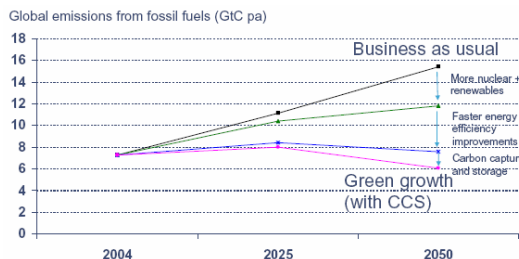
Economic costs of unabated climate change



* incl. feedback loops, non-market impacts, & distribution effects

The price of an "insurance" policy 1/2

Target: avoid dangerous climate change, i.e. ~ 2°C or around 450ppm

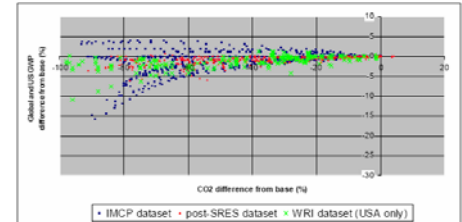


Source: PwC model projections: the four lines correspond (starting from the top) to our Baseline, Greener Fuel Mix, Green Growth, and Green Growth + CCS scenarios. 'Sustainable' is defined here as consistent with stabilising global atmospheric CO₂ concentrations at around 450ppm by 2050.

Source: PwC, The World in 2050, Implications of global growth for carbon emissions and climate change policy, 2006

The price of an "insurance" policy 2/2

Effect on Gross World Product (GWP) of CO₂ mitigation



A broad range of modelling studies show that costs of reducing carbon emissions by around 50-70% relative to the baseline are clustered in the range of -2% (net gain) to 5% of GDP, with an average around 1% cost of GDP per year (Stern Review).

In 2050, this would lower global output by around 2-3% compared to the baseline, or about 1 year of trend growth.

Source: Barker, T., M.S. Qureshi and J. Köhler (2006): 'The costs of greenhouse-gas mitigation with induced technological change: A Meta-Analysis of estimates in the literature', 4CMR, Cambridge Centre for Climate Change Mitigation Research, Cambridge: University of Cambridge.

The path towards stabilization



How swiftly and aggressively should we act?

model runs	Discount rate	Utility curvature parameter	Consistent with current savings rate	Social cost of carbon 2005, USD, per ton	Social cost of carbon 2050, USD, per ton
Nordhaus parameters	3.0%	About 1.0	Yes	17.12	84.00
Stern Review parameters	0.1%	1.00	No	159.00	Not available
Mixed	0.1%	2.25	Yes	19.55	Not available
Current market prices				CFI (CCX): \$ 4.0 EUA: € 0.9 CER: \$ 6-10	

Source: Nordhaus, W., "The Stern Review on the Economics of Climate Change," November 17, 2006.

Conclusions

- The distribution of future outcomes is heavily weighted towards fairly dire outcomes, with temperature rising and global income and welfare declining.
- The precautionary principle dictates that, given this distribution of future outcomes, action should be taken today to mitigate a likely large loss of welfare in the future.
- The available evidence on costs and benefits indicates that appropriate actions taken today are cost-effective and should not be delayed.
- Studies vary with respect to the appropriate price that a global carbon tax, or an equivalent quota system, should impose today and how quickly it should rise.
- Current voluntary and compliance market cover only a tiny fraction of emissions. Market prices are nowhere near the social cost of carbon.