BASQUE CENTRE
FOR CLIMATE CHANGE
Klima Aldaketa Ikergai

The Economics of Climate Change After Cancún

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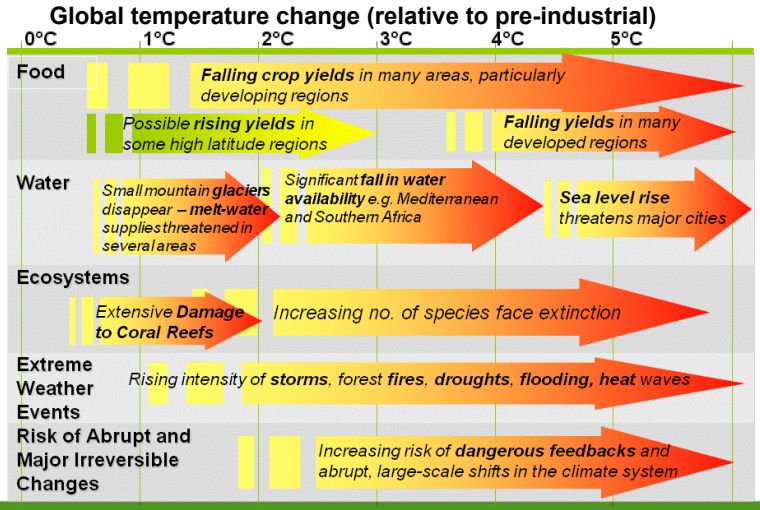
Índice

The Nature of the Problem: An Introduction

- Climate change is very different from other challenges we have faced as a planet.
- The three key issues are:
  - Huge uncertainty about future impacts
  - The very long term nature of the impacts
  - The big divide between rich and poor countries with respect to responsibilities for climate change and the impacts of climate change.

Global Impacts and Climate Change



Coastal glaciers

Muir Glacier, Alaska

August 1941 **August 2004**

NSIDC/WDC for Glaciology, Boulder, compiler. 2002, updated 2006. *Online glacier photograph database*. Boulder, CO: National Snow and Ice Data Center.

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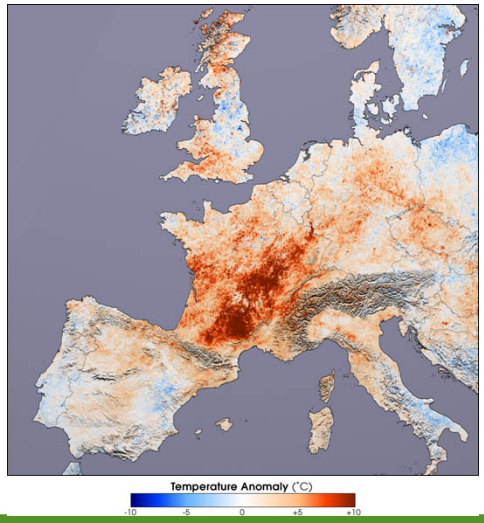
2003 European Heat Wave



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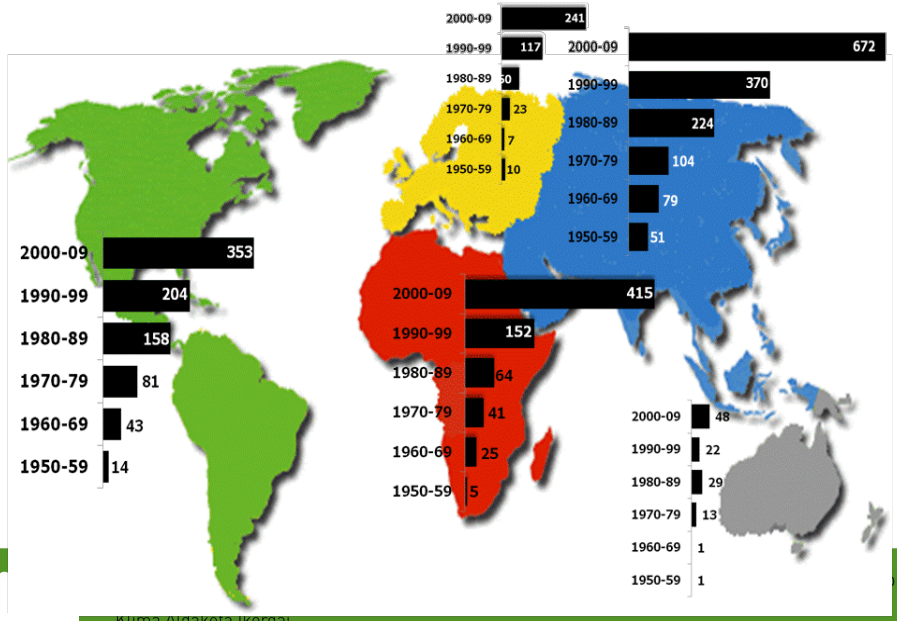
Floods 1950-2009



Source: The international disaster data base. Center for Research on Epidemiology of Disasters. 2010.

Droughts

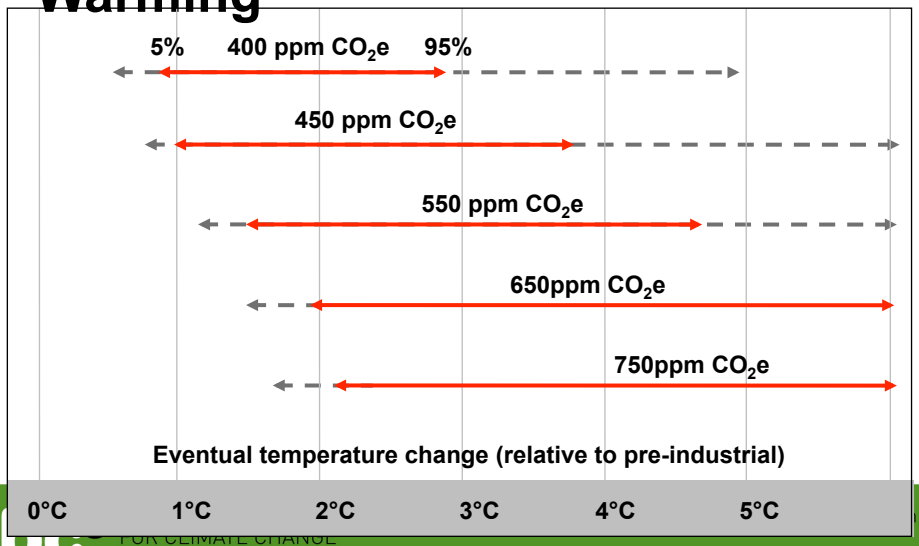
400,000,000 people are living under extreme drought conditions

"Very Dry" Land, Worldwide:

15% in 1970

38% in 2010

Stabilisation and Commitment to Warming



A Current "Consensus"

- We should aim to stabilize GHG concentrations at 450 ppmv to avoid serious risks.
- This will require global emissions to peak in 2020 and to decline steadily thereafter.
- By 2050 emissions globally should be 50% of 2000 levels
- For developed countries they need to fall by around 80% by 2050.

Can We Achieve This Target?

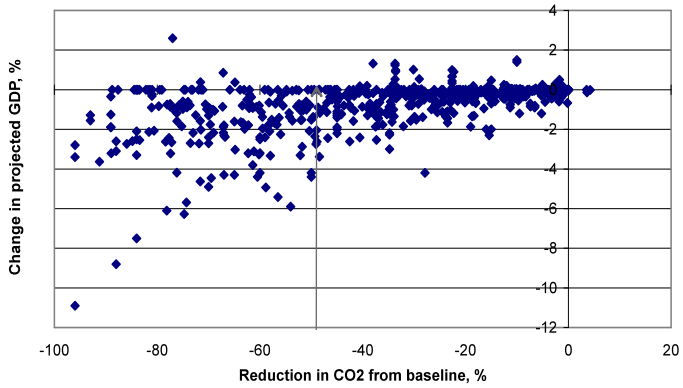
- Yes, but at what cost?
- And who is going to make the required reductions in emissions?
- These are the most difficult questions to answer in the context of the climate change negotiations.
- In the following slides I present some options based on the POLES model.

How Can We Justify this Conclusion?

- Some studies, such as that of Stern and the IPCC show that without a policy of emissions reductions we would have a loss equal to around 5-20% of the worlds GDP
- At the same time the costs of achieving stablization at 450 ppm is approximately 1-2% of GDP.

The Costs of Emissions Reductions are not Uniform

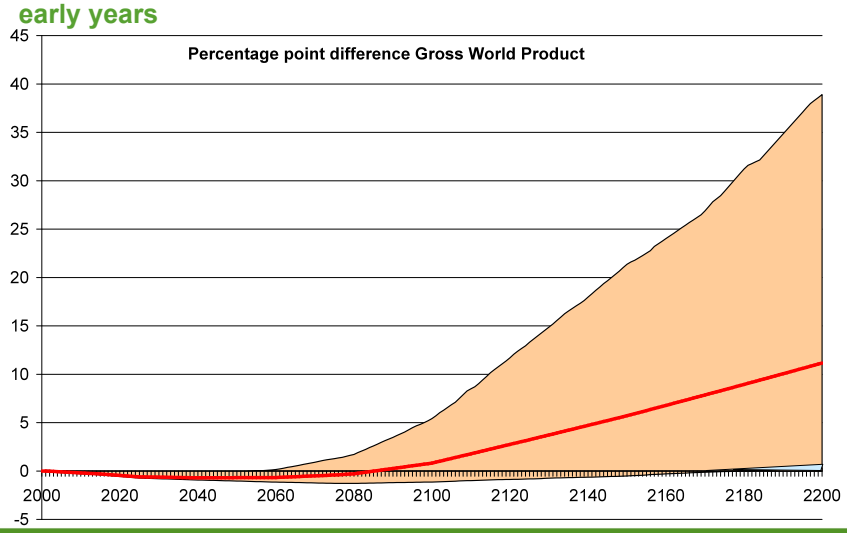
- While Stern estimated the costs at around 1% de world GDP other studies have given figures ranging from 0,0 and 4% of GDP



Estimates of Damages with No Action (% of GDP)

	Impactos del mercado	Impactos del mercado + impactos más amplios
Escenario Básico	5% (0-12%)	11% (2-27%)
Escenario Alto	7% (1-17%)	14% (3-32%)

While the costs are much lower than the damages for stabilization over a long period, the costs exceed damages in early years



Why Is Policy on CC Controversial?

- The damages are in the future (2060+), while the costs are incurred now.
- To get the present value of net benefits to be positive we need very low discount rates. Stern takes 0.1%. With higher rates the net benefits may be negative with a 450 ppm target. Typical (real) rates are around 3-4%
- But with such high uncertainties can we use Benefit Cost analysis?

Uncertainty

- Problem is not only 'uncertainty' but not knowing the probabilities of different outcomes (e.g. of climate sensitivity).
- "Known unknowns vs unknown unknowns"
- Going for the objective of 450 ppmv stabilization really buys us reduced risks of catastrophic climate change.

GLOBAL CHANGE SCIENCE POLICY MIT

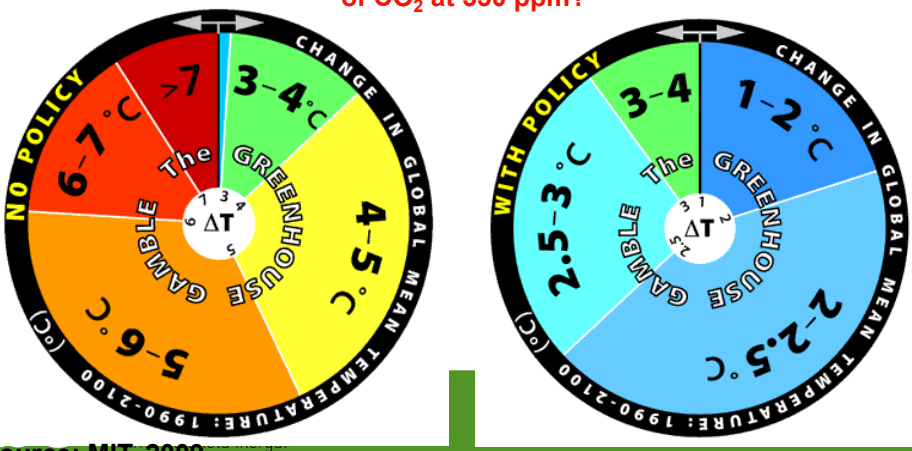
Value of a Climate Policy Under Uncertainty

2009

NO POLICY

What would we buy with STABILIZATION of CO_2 at 550 ppm?

A NEW WHEEL with lower odds of EXTREMES



Source: MIT, 2009

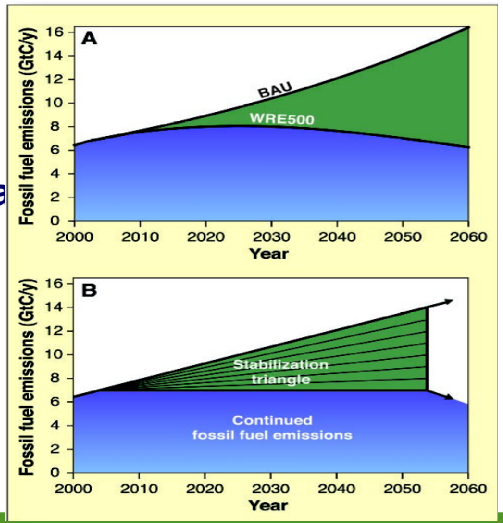
rpnnn@mit.edu

Policies to Reduce Emissions

- A global reduction of 50% by 2050 is possible.
- Innovation is key to achieving this objective.

Policies for Reduction of Emissions

The 'Stabilization Wedges' of Pacala and Socolow



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Some Measures for Reducing Emissions

i. **Efficiency and energy saving in transport—**vehículos híbridos ***

ii. **Efficiency and energy saving in buildings** (the built environment accounts for 1/3rd of all energy consumed in a country like Spain. *

iii. **Substitution of coal with gas***

iv. **Carbon capture and storage****

v. **Development of hydrogen based energy *****

vi. **Nuclear energy** *

vii. **Wind and solar energy****

viii. **Biofuels for transport** ***

ix. **Hydrogen for transport.*****

What Will it Cost?

- Energy will cost more, but increases will not be large.
- Increases in R&D will have to be funded by cutting other budgets.
- How much we have to pay to buy emissions rights will depend on how they are allocated. That could cost more…
- Costs could be reduced if we include avoided deforestation.

By How Much Will REDD Reduce the Economic Costs of a Climate Policy ?

Woods Hole Research Center (Brazil only)	-12%
IIASA	-25%
Sohngen	-23%

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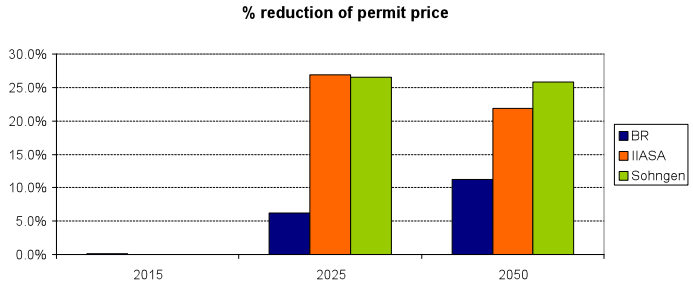
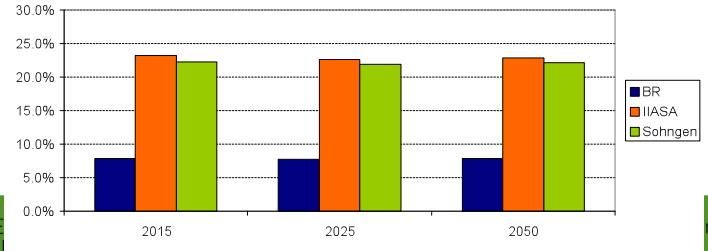
Will REDD depress Carbon Prices ?

NO BANKING



BANKING



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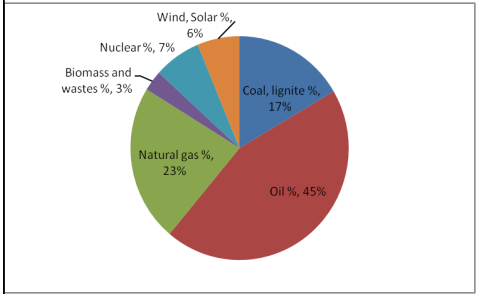
Will REDD displace deployment of low carbon technology?

- REDD reduces investments in Renewable power by 2% per year (Brazil only) to 5% per year (all REDD countries)
- Banking increases investments till 2030 by 5-10% per year

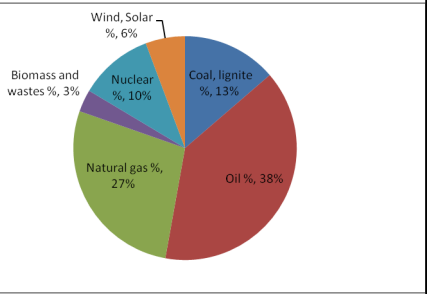
Results for 2030: Energy Use in Spain

BASELINE CASE



No Sequestered Carbon

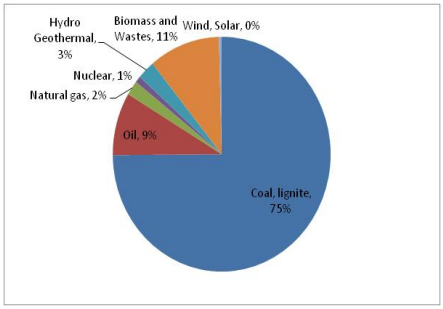
Target 50% Global Reduction by 2050



Sequestered Carbon Via CCS= Biomass + Wind/Solar

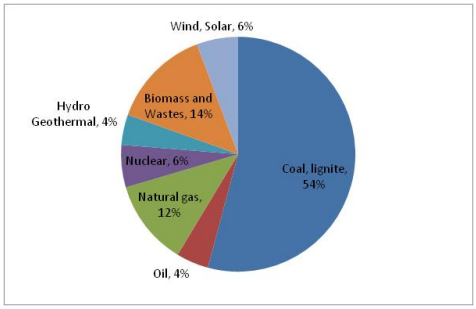
Results for 2030: Energy Use in China

BASELINE CASE



No Sequestered Carbon

Target 50% Global Reduction by 2050



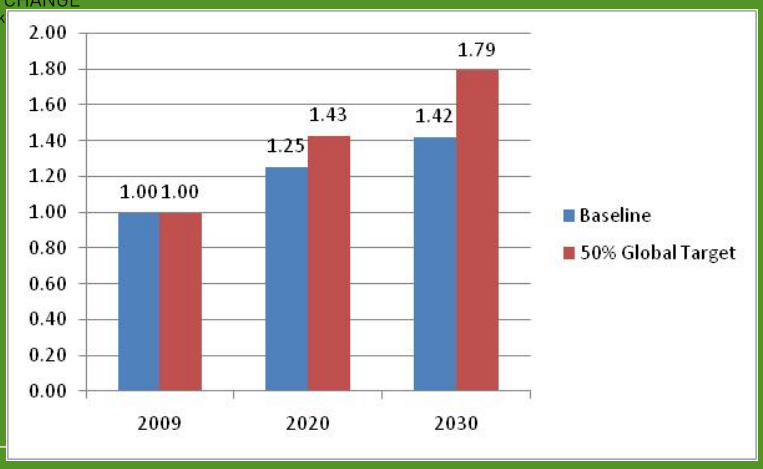
Sequestered Carbon Via CCS= Biomass + Wind/Solar

Implications for the Price of Oil and Fossil Fuels

Caso Básico		2010	2020	2030
CO2	MT	29.940	35.434	40.550
Precio Petróleo	€05/bbl	65,7	77,2	95,2
Precio Carbono	€05/ton/ CO2	0	0	0

Reducción de 50%		2010	2020	2030
CO2	MT	29.940	29.392	23.309
Precio Petróleo	€05/bbl	65,7	73,4	77,8
Precio Carbono	€05/ton/ CO2	8,9	41,4	118,3

Price of Gasoline in 2030 €/lt.
Impact of CO2 Tax is less than normal variations due to oil price!



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Implications for Investments

- The targets can be met but there are problems of financing the investments

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Implicaciones de inversión enel sector energético

- La Agencia Internacional de la Energía (AIE) estimates that annual investment in energy that is needed is around US$250 billion between 2010 and 2020 and around US$936 billon between 2021 and 2030 to achieve stabilization at 450 ppm.
- Of this total, energy efficiency improvements take up 70% in 2020 and 60% in 2030. Renewable energy takes up 19% in 2020 and 24% in 2030.
- This is equal to 0,3% of global GDP PIB as of 2010 and 0,7% of GDP as estimated for 2030. Not such a high figure!
- Bt the problem is more serious in developing countries. At present they need US$190 billones a year to meet their development needs, while the actual level of finance available is only US$80 billion.

Implications for investment renewable energy and R&D

- Investment in renewable energy in 2008 was about US $120 billion up from US$20 billion in 2004.
- Main areas were wind (42%), solar (32%), biomass (13%). Amost US$80 billones of the total was in the EU and US. SO we may be on the right track to meet the 2020 objectives!
- But investment in R&D is much lower. Public funding for low carbon energy has declined from 11% in 1985 to 4% in 2007. This needs to go up significantly!

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Rich and Poor Countries

A Challenge to Climate Policy and How Science Can Help

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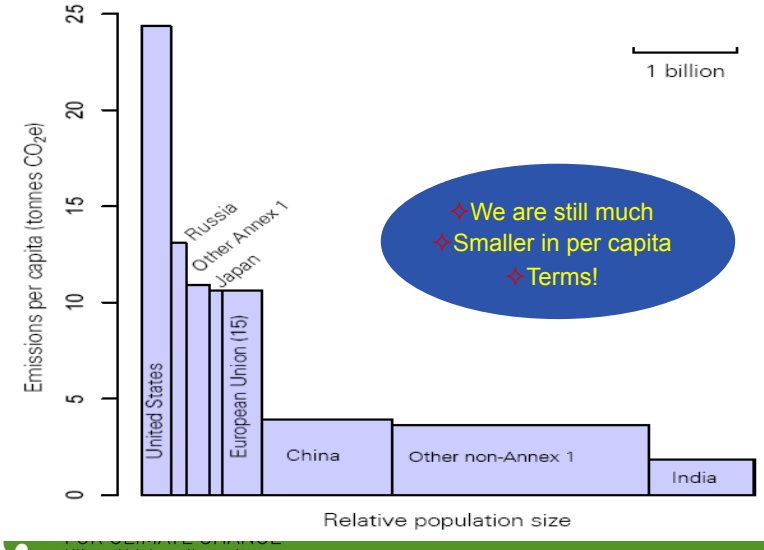
Universidad del País Vasco Euskal Herriko Unibertsitatea
ikerbasque Basque Foundation for Science
ihobe

Another Conflicting Interest: Rich and Poor

- Rich will have to make a bigger sacrifice to meet climate objectives.
- By and large the poor are more negatively affected by any future climate change.
- Poor countries will have to make some sacrifices as well if we are to meet targets.
- Rich carry a debt of responsibility for the GHG concentrations.

The Point that Developing Countries Make



How to Allocate Emissions Rights

- We can allocate them based on population applied to current emission.
- Then developed countries will have to buy a large number from developing countries
- Or we can allocate based on population but applied to historic emissions (go back to 1850?)
- Then developed countries will have to buy even more from developing countries!

Allocation Based on Population

		2020	2030
Emissions in China	MTCO2	6821	4862
Allowed Emissions	MTCO2	5319	3891
Net Purchase	€Bn.	62	115
Emissions in India	MTCO2	1885	1738
Allowed Emissions	MTCO2	5191	4081
Net Purchase	€Bn.	-137	-277
Emissions in EU27	MTCO2	3628	2867
Allowed Emissions	MTCO2	1882	1352
Net Purchase	€Bn.	72	179
Price of Carbon		41.4	118.3

Allocation Based on Population

- In our model China and EU27 have to buy significant number of rights
- EU27 pays €72 Bn (€150 per person). In 2020 and €179 Bn. In 2030. Total ODA in 2007 was only €80 Bn.
- Problem at Copenhagen was critically on how to allocate these rights. It was clear that EU and other rich countries will agree to these kinds of transfers

So What is the Way Forward?

- Each country or region makes its own commitment to GHG reduction. (Not sure we can get to 450ppmv)
- Developing countries accept bigger reduction targets than their 'rights' would justify, but under major increases in ODA, technology transfer and funding for adaptation. (What would be enough and not all developing countries are in the same situation).

Adaptation and Climate Change

- Even if we achieve the 2ºC stabilization target we will have to adapt to climate change.
- These adaptations will be needed in several areas including:Health, Sea Level Rise, Freshwater Systems, Extreme Events, Infrastructure, Agriculture, Ecosystems, Other sectors (tourism)

Initial Estimates of Costs of Adaptation

• Initial studies (excluding UNFCCC) involved a macro approach in which the authors started with an estimate of the level of investment in each country that is climate sensitive and applied a "mark-up" to account for the additional costs of climate change.

Study	Cost of Adaptation	Regional coverage	Time frame	Sectors
World Bank (2006)	$ 9 to 41 billion/year	Developing countries	Present	Unspecified
Stern Review (2006)	$ 4 to 37 billion/year	Developing countries	Present	Unspecified
Oxfam (2007) .	Min, $ 50 billion/ year	Developing countries	Present	Unspecified
UNDP (2007) .	$ 86 to 109 billion/year	Developing countries	2015	Unspecified
UNFCCC (2007) .	$ 28 to 67 billion/year	Developing countries	2030	See *
UNFCCC (2007) .	$ 44 to 166 billion/year	Global	2030	See **

Adaptation: The Current Situation

- Commitment in principle to a fund of around US$100 bn. for adaptation for developing countries by 2020 but we are way short of that.
- Difficult to separate development finance from adaptation finance. Development definitely makes countries more resilient to climate change. But they also need additional funds for adaptation.

Adaptation: The Current Situation

- Currently all countries are struggling with adaptation planning:
  - Need for downscaling of climate models to plan local actions
  - Need for application of better methods of evaluating proposed programmes (NAPAs are still very weak).
  - Still probably the most important activity is getting better information on impacts prior to taking action.
- International action also has a key role in supporting global public goods for adaptation
  - Disaster response
  - Crop varieties and technology
  - Forecasting climate and weather

What Has Been Achieved at Cancún?

- On the positive side:
  - Some further agreement on the Green Climate Fund which will raise US$100 bn a year by 2020. (probably to be run by the World Bank, but with some control from developing countries).
  - It sets out parameters for reducing emissions from deforestation and transferring technology from the North to the South,
  - The option of extending the Kyoto Protocol beyond 2012 is still open.
  - Some progress on monitoring and verification

What Has Been Achieved at Cancún?

- Not so positive:
  - Still no legally binding agreement to lower emissions targets.
  - The voluntary commitments amount to much less than what is needed to stabilise at 450 ppmv.
  - Japan and Russia may still walk away from Kyoto extension if China and USA do not join.

Conclusions

- Climate change is our of the most serious challenges facing mankind today.
- The impacts of climate change affect all areas of society as well as the environment.
- The remain huge uncertainites regarding level and impacts of climate change that need to be accounted for in the design of policy.
- To reduce the impacts of climate change it is very important to reduce emissions of greenhouse gases.
- The costs of not acting to reduce emissions and stabilize concentrations are much greater than the costs of mitigation.

Conclusions

- An increase in knowledge is very important
- But the need for more knowledge is not an excuse for lack of action. We must aim to meet 450 ppmv.
- Action can and should be flexible.
- International agreements with cuts by all parties are essential
- Efficiency and equity objectives can be decoupled – use of market based instrument with 'fair' allocations of rights can play a role.
- Action on adaptation is essential

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Thank you!

Muchas Gracias!