Dr Mattia Romani
Office of Climate Change, UK Government
Main conclusions:

1. Cost of inaction: between 5 and 20% of GDP, now and forever
2. Cost of action to go to 550ppm CO$_2$e: 1% of GDP in 2050
3. There is a case for urgent action
4. Carbon market + technology policy + shared understanding
5. A global deal based on markets is desirable and in reach
Structure of the presentation

- Cost of inaction – risk, uncertainty and ethics
- Cost of action – mitigation and technology
- Towards a global deal? The European experience
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How to estimate cost of inaction

Analytic foundations:

Climate change is an externality with a difference:

• Global
• Long-term
• Uncertain
• Potentially large and irreversible

Hence key roles in the analysis of:

• Economics of Risk
• Ethics
How to estimate cost of inaction

- Stream of **future damages** from inaction taking **risk** into account
- **consumption** as the ‘common denominator’
- **BGE** as a way of taking into account all streams of cost
- Decide on **discount factors** on the basis of **ethics**
Expert forecasts can be wrong…
Working with Uncertainty

Population, technology, production, consumption

Emissions

Atmospheric concentrations

Radiative forcing

Temperature rise and global climate change

Direct impacts (e.g. crops, forests, ecosystems)

Socio-economic impacts

% Change in Global Cereal Production

Temperature Increase

Cumulative CO2 Emissions

Probability
Uncertainty, risk and action

• **Uncertainty does not excuse inaction**
• When stakes are large, decisions are taken under uncertainty, and **insurance** is obtained
• Example of large scale insurance:
  – Nuclear technology for power sector (Price Anderson Act)
  – Avian Flu ($2 billion worth of Tamilflu in the US)
  – Defence
  – Fire insurance
  – Etc…
Stabilisation and eventual change in temperature

Eventual temperature change (relative to pre-industrial)
### Projected impacts of climate change

<table>
<thead>
<tr>
<th>Global temperature change (relative to pre-industrial)</th>
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<tbody>
<tr>
<td><strong>0°C</strong></td>
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<tr>
<td><strong>1°C</strong></td>
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<tr>
<td><strong>2°C</strong></td>
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<tr>
<td><strong>3°C</strong></td>
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<td><strong>4°C</strong></td>
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<td><strong>5°C</strong></td>
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<tr>
<th>Food</th>
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<tr>
<td><strong>Small mountain glaciers disappear – water supplies threatened in several areas</strong></td>
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<tr>
<td><strong>Significant decreases in water availability in many areas, including Mediterranean and Southern Africa</strong></td>
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<tr>
<td><strong>Sea level rise threatens major cities</strong></td>
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<tr>
<th>Water</th>
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<tbody>
<tr>
<td><strong>Extensive Damage to Coral Reefs</strong></td>
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<tr>
<td><strong>Rising number of species face extinction</strong></td>
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<th>Ecosystems</th>
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<tr>
<td><strong>Rising intensity of storms, forest fires, droughts, flooding and heat waves</strong></td>
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<th>Extreme Weather Events</th>
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<td><strong>Increasing risk of dangerous feedbacks and abrupt, large-scale shifts in the climate system</strong></td>
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<tr>
<th>Risk of Abrupt and Major Irreversible Changes</th>
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Total cost of inaction

- 5 to 20% now and forever
- **Central prediction is 10%**
- Now and forever involves an **ethical judgment** on discounting future flows
- Changing the ethics and damages weights strengthens the case for action
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Reducing emissions requires action across many sectors

- **ENERGY EMISSIONS**
  - Power (24%)
  - Transport (14%)
  - Buildings (8%)

- **NON-ENERGY EMISSIONS**
  - Industry (14%)
  - Other energy related (5%)
  - Land use (18%)
  - Waste (3%)
  - Agriculture (14%)

Total emissions in 2000: 42 GtCO₂e.
Avoiding deforestation

- Curbing deforestation is highly cost-effective, and significant
- Forest management led by nation where the forest stands
- Large-scale pilot schemes with effective international support

Substantial capital flows to forest management
Growth, change and opportunity

- Mitigation costs around 1% p.a. worldwide
- Mitigation fully consistent the aspirations for growth and development in poor and rich countries.
- **Business as usual is not.**
- Costs will not be evenly distributed:
  - Competitiveness
  - New markets will be created
- **Mitigation policy and potential win-wins:**
  - energy - air quality, energy security and energy access
  - forestry - watershed protection, biodiversity, rural livelihoods
If we act now, the economic benefits from efficiency could pay for necessary supply-side measures.

Source: McKinsey
Target: stocks, history, flows

- **US and the EU** countries accounted for over half of cumulative global emissions from 1900 to 2005
- Total current emissions: **40-45 GtCO2e p.a.**
- **50% reduction by 2050** implies 20-25 Gt, which means per capita global GHG emissions of 2-3T /capita (20-25 Gt divided by 9 billion population)
- Currently **US ~ 20+, Europe ~10+, China ~5+, India ~2+ T/capita**
- Thus 80% reductions would bring Europe, but not US, down to world average. Many developing countries would have to cut strongly too if world average of **2-3 T/capita is to be achieved**
Delaying mitigation is dangerous and costly

Stabilising below 450ppm CO\textsubscript{2}e would require emissions to peak by 2010 with 6-10% p.a. decline thereafter.

If emissions peak in 2020, we can stabilise below 550ppm CO\textsubscript{2}e if we achieve annual declines of 1 – 2.5% afterwards.

A 10 year delay almost doubles the annual rate of decline required.
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Four Policy principles

• **Pricing the externality** - carbon pricing via tax or trading

• **Bringing forward lower carbon technology** - research, development and deployment

• **Overcoming information barriers and transaction costs** - regulation, standards

• Promoting a **shared understanding** of responsible behaviour across all societies – beyond sticks and carrots
The path to Copenhagen

2007

EU FIN GER PORT SLO FRA CZ SWE ESP

COP 12 Indonesia COP 13 COP 14, Poland COP 15, Denmark COP16, Latin America

Science 4th AR IPCC Convention Dialogue Follow-Up Convention Dialogue BALI ROADMAP Post-2012 Deal

Review of Kyoto Protocol (Art 9) Follow-Up Review

G20 Gleneagles Plan of Action G8 GER G8 JAP G8 ITA US Major Economies
Bracketing text

• ‘The Parties [ are urged to ] [ shall ] [ must ] [ should ] [ may ] submit their reports to the Secretariat [ before ] [ no later than ] [ January 1, 2005 ] [ June 30, 2005 ] [ the Xth session of the Subsidiary Bodies ].’

• Text adopted once brackets are cleared.
Key elements of a global deal

**Targets and Trade**

- Confirm Heiligendamm 50% cuts in world emissions by 2050 with rich country cuts at least 75%

- Trading schemes *open to trade with other countries, with special supply side from developing countries*

- Funding schemes for deforestation, CCS, ODA

- Incentives for developing countries to play strong role in global deal, eventually taking on their own targets.

- Main way forward: domestic action
Commitments: percentages

- G8 Heiligendamm – 50% by 2050 (consistent with stabilisation around 500ppm CO$_2$e)

- California (and US under most presidential candidates) - 80% from 1990 levels by 2050

- France – 75% by 2050 (Factor 4), relative to 1990

- EU Spring Council: 60-80% by 2050 and 20-30% by 2020, relative to 1990

- Germany – 40% by 2020, relative to 1990
There is a rising tide for action to combat global warming within the US

November 2007

Source: NRDC

Commitment to Mandatory Cap (25 States)  
(41% of total US emissions)

Considering Mandatory Cap (7 States)  
(9% of total US emissions)

Mayors Signed on to Climate Agreement (691)

Cap on Vehicle Emissions (15 States)  
(40% of US vehicle emissions)

Source: NRDC
Potential varies by region: value of a federal system

Cost: Real 2005 dollars per ton CO2e

- Northeast: 330 megatons
- West: 600 megatons
- Midwest: 890 megatons
- South: 1,130 megatons

Source: McKinsey Analysis
Coal to gas switch potential in the US

- Coal accounts for 43% of power production in the US and ~ 60% of emissions (which is currently ~ 1.5bn CO2 tonnes/year).
- Gas fired power plants emit 45% less CO2 than coal fired ones (same heat). Substantial gains from switching to clean coal.
- Under a cap and trade scheme, at a price of $50/tonne of CO2, the yearly liability of coal power plants is $75bn.
  - Switching to gas would decrease the liability of 34bn/year. Clean coal would also create big savings in carbon fees.

POTENTIAL OPORTUNITY FOR ALASKA?
Main conclusions:

1. Cost of inaction: between 5 and 20% of GDP, now and forever
2. Cost of action to stabilize at 550ppm CO$_2$e: 1% of GDP in 2050
3. There is a case for urgent action, waiting is costly
4. Carbon market + technology policy + shared understanding
5. A global deal based on markets and incentives is desirable and offers opportunities. It won’t stop the world economy.
“No matter what happens, the US Navy is not going to be caught napping”

Frank Knox, U.S. Secretary of the Navy
4th December 1941