Costing Climate Change
Impacts and Adaptations in Europe

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Presentation Outline

- European adaptation policy and the role of economics
- Costs of impacts and adaptation in Europe
- Research gaps
European Mitigation and Adaptation Policy

- Strong move towards long-term mitigation targets in recent years
  - EU 2\textsuperscript{a} target from pre-industrial
  - Member State 2050 targets (UK 60% CO\textsubscript{2}, France F4, Sweden 50-60% GHG)

- Also increasing number of short-term mitigation targets
  - EU 20% GHG reduction target by 2020
  - Member State short-term targets (e.g. UK 26-32% CO\textsubscript{2}, Germany 40% GHG)

- Recent move to adaptation policy
  - Green Paper announced in summer 2007 (identify issues, consultation)
  - White Paper in November 2008 (initial proposals)
  - National adaptation strategies (e.g. UK, Finland, etc)
Economics of Climate Change

- Increased interest in the economics of climate change and adaptation in Europe
- Stern Review
- EEA report – Climate Change: the Cost of Inaction and the Cost of Adaptation
  - Assess methodological issues
  - Focus on a European scale
  - Primarily targeted to a wider (impacts) audience
Justification for planned/Government adaptation

- Information, knowledge and learning
- Facilitation and exchange of data
- Early-warning and disaster relief
- Mainstreaming climate resilience
- Non-market sectors (public collective goods, like ecosystems)
- Areas where state has a strong regulatory role (like water)
- Infrastructure planning and development
- Facilitating adaptation in the market
- Regulating adaptation spillovers (co-benefits, or knock-on effects vulnerable)
- Compensating for the unequal distribution of climate impacts

*Source: Berkhout, ADAM*
But why EU adaptation action?

- Information exchange, best practice, etc
- Trans-boundary (e.g. river catchments, fisheries, disease spread)
- Solidarity (addressing equity, or where individual MS action alone might affect others).
- Size of EU budget and spending programmes, from structural funds to agriculture
- Community treaties e.g. where lack of action might impact (e.g. movements of goods).
- Where the size of EU can leverage greater results, e.g. external policy
- Where existing policy precedent *
- Where EU economy impacts or European wide issues (including migration and security)
Adaptation Policy Framework

1a. Define policy aim
1b. Propose generic adaptation objectives
2. Determine priority sectors for action
3. Characterise priority risks and opportunities
4. Propose adaptation objectives
5a. Define targets
5b. Select indicators
6. Identify adaptation options
7. Appraise options
8. Identify cross sectoral overlap and possible conflicts
9. Link up policy framework
10. Review and Revise

Mainstreaming

Economic perspective

Source: Horrocks, L, Mayhew, J., Watkiss, P, Hunt, A., Downing
The role of economics – policy goals

- The literature generally reports four main principles / goals for adaptation policy:
  - Efficiency, Equity, Effectiveness, and Flexibility

- On efficiency, historically EU policy has favoured cost-effectiveness rather than CBA
  - Increasingly consideration of costs and benefits (though rarely CBA) in Impact Assessment (policy appraisal).

- Need to introduce some economic thinking in C-EA. Currently towards a goal of ‘cost-effective and proportionate’, i.e. between ‘living with risk’ and ‘climate proofing’

- Role for economics to prevent mal-adaptation, defined in widest sense as:
  - Inefficient use of resources (e.g. climate-proofing)
  - Ineffective (e.g. for future climatic risks that do not subsequently occur, lifetimes)
  - Displacing vulnerability (e.g. from one actor to another) and/or
  - Reducing the possibility for future adaptations
Methodological frameworks for adaptation project CBA available (e.g. UKCIP, in Stern)

For Gov. planned adaptation appraisal, need to consider the do nothing policy with ‘autonomous’ adaptation included

Difficult issues on uncertainty (scenarios, model variation), and for EC, a 2º trap

And in type of climate signal (SLR or mean temperature vs. extremes)

No consistency on with/w.out socio-economic

Lack of information on costs of adaptation (including direct, indirect, transition) and relationships/values for benefits estimation

Ancillary benefits and distributional aspects

All of this means very challenging

There are emerging estimates of European costs of inaction in physical terms and monetary estimates, both European wide or country specific, e.g. IPCC

Number of country studies (e.g. Finland - FinAdapt, UK - UKCIP, others emerging).

Emerging EU wide analysis:

- EEA costs of adaptation, plus Climate Change Indicators 2008 Report
- PESETA (http://peseta.jrc.es/index.htm) has impacts & economic costs for coastal flooding, tourism, agriculture, health, riverine flooding and energy, for 2010-2040, and 2070 to 2100 for B2 and A2
- ADAM project (http://www.adamproject.eu/), economics of adaptation, analysis adaptation in MS, adaptation meta-analysis, case studies on electricity, extremes
- OECD studies, ALPS, literature review urban cities, port cities

These show ‘net’ impacts for Europe are often modest (e.g. agriculture, net mortality, energy). However, strong distributional effects between north and south

Consideration of costs and benefits of adaptation mostly qualitative
Change in mean summer temperature

Note strong distributional nature of the climate signal
Similar pattern with precipitation, reductions in areas of existing water scarcity (S. Europe)
Coasts
(Sea Level Rise and Storm Surge)

- Model effects of SLR and storm surge, and impacts, costs and adaptation (DIVA)
- E.g. high SLR (~50 cm) by 2100 in Europe
  - 19,000 km² of land permanently lost
  - 1.4 million people flooded each year
  - Economic costs estimated at €18 Bill/yr
- Adaptation reduces (CBA optimis) to land lost to 1,000 km² and damages to €1 billion/y
- Adaptation costs around €1 billion / year (technical), therefore benefits > costs.
- Area for planned adaptation

- Model assume perfect foresight and quick response (optimistic). Technical adaptation (not ecosystems – e.g. managed retreat).
- Reality = local focus. Emerging MS or local studies, e.g. London 2100
Analysis of impacts and economic costs in Europe

- Summer heat wave 2003 more than 35,000 excess deaths
- Heat mortality, 50,000 (B2) to 100,000 (A2) deaths/year by 2100
- Valuation €25 to 120 Billion/yr (WTP: YOLL/VSL)
- Strong spatial pattern (South/S-E),
- Relationships used affect the distribution (and model used)
- Autonomous adapt. (1º/3dec) acclimatisation to 20,000/yr (A2)
- Food borne disease (24 to 50k Rep cases ([1-5%] and €0.2 Bill/yr
- Coastal flooding/well being ((5M cases/€1B/yr), but adaptation
- Also vector borne disease, air pollution
- Planned adaptation (heat alert) and cCASHh study shows low cost, existing public health, but little knowledge benefits (guess)
- Note benefits from reduction in cold related mortality – likely to be larger (No/€) than impacts
a) Climate dependent  
b) Country specific

Health

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Change in Heat Related Mortality
No acclimisation, Watkiss et al, PESETA
River Flooding, Agriculture

Change in damage (Euro) for river floods with 100 year return period A2 scenario. (Feyen et al., 2008) no adaptation

Also detailed river catchment level (e.g. Upper Danube)

Strong role for planned adaptation, Local assessments (e.g. Netherlands)

Change in agricultural yield, A2, 2080s A. Iglesias/L. Garrote, PESETA

Identification of adaptation options (crop species, management) but not through to adap. costs and benefits

Autonomous / priv – effect of EU budget.
Tourism, Energy

UK. Decreased wintertime heating -£2.8 billion, but increased space cooling +£1.2 billion by 2100.

Finland. Wintertime heating decrease by 10% by 2050, and by 20 to 30% by 2100.

Spain / Italy / Med
Summer space cooling for AC increase electricity demand up to 50% in Italy and Spain by the 2080s

Tourism (Summer TCI, A2, 2080s), P. Martens/B. Amelung/A. Moreno PESETA
Adaptation not yet included, though largely autonomous/priv
Plus loss winter tourism (OECD)

Cooling = adaptation as well as an impact
Number major energy studies this summer on costs of impacts, and costs of adaptation (infrastructure) in ADAM
Water, Ecosystem Services

Alcamo et al, IPCC. Area of high water stress 19% today to 35% by the 2070s (and No of people affected 16 million and 44 million)

UK - Water deficit by 2100 in south-east England (Wade et al, 2006) £41 and 388 million a year, costs of adaptation £6 to £39 million/year

Top: Change in Forest production – 44% increase in growth (Finland, FinAdapt)

Botton: Net change in A2 2080 August fire severity, JRC

For other sectors, major quantification and valuation challenge
Emerging evidence of adaptation at local scale, but studies rarely include detailed quantification, and even rarer to find economic analysis.

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### London Studies

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<thead>
<tr>
<th>Reference</th>
<th>Primary purpose</th>
<th>Funder</th>
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<tbody>
<tr>
<td>LCCP, 2002</td>
<td>Scoping study of CC impacts and adaptation options</td>
<td>London Climate Change Partnership</td>
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<tr>
<td>GLA, 2006</td>
<td>Analysis of London’s urban heat Island effect</td>
<td>Greater London Authority</td>
</tr>
<tr>
<td>LCCP, 2006a</td>
<td>Review of adaptation options utilised in other cities</td>
<td>London Climate Change Partnership</td>
</tr>
<tr>
<td>LCCP, 2006b</td>
<td>Adaptation options in financial services sector</td>
<td>London Climate Change Partnership</td>
</tr>
<tr>
<td>City of London, 2006</td>
<td>Adaptation strategy for City of London</td>
<td>City of London Corporation</td>
</tr>
<tr>
<td>LCCP, 2005</td>
<td>Impacts on Transport Systems and adaptation options</td>
<td>London Climate Change Partnership</td>
</tr>
<tr>
<td>Kovats et. al. 2003</td>
<td>Health effects of heat waves</td>
<td>European Commission</td>
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Also regional studies for almost every individual region in UK
+ Detailed sectoral studies for most sector (UKCIP)
None of these work within an economic framework (CBA)
Almost none consider the quantitative costs or benefits of adaptation

Knowledge on costs and benefits of adaptation extremely limited

The Risk Matrix – Social Costs of CC

Projection
- e.g. temperature or SLR

Limit of coverage of many studies

Market

Non-Market

Socially contingent

Bounded
- e.g. precipitation and extremes

Limits of coverage for most studies

Major change
- e.g. major tipping points

One or two studies

None

None

None

None

None

None

None

None

None

None

Limit of coverage of many studies

None

Source: Watkiss et al, 2006

Missing elements will include positives and negatives, but more likely to be negative
Current Economic Perspectives

- Very large challenges in developing and applying economics to project level adaptation, and even greater for the policy level.

- Evidence on economic costs and benefits of adaptation is limited, detailed analysis is extremely resource intensive, and high uncertainty, so tends not to get included in most studies.

- So what should we do?

- Given current uncertainty, and time available, need policy flexibility.

- Priority is for building capacity, and no regrets (or low cost) options.

- Plus early identification of areas where more detailed analysis is needed (e.g. infrastructure), or large-scale irreversibility (e.g. ecosystems) re precautionary.

- Incorporation of climate change risk into sectoral policy (mainstreaming), but also development of economic appraisal for analysis of adaptation options.
Research priorities (from EEA study)

- To identify adaptation options at different levels across Europe and assess costs
  - Increase number of real case studies
  - Strengthen integration and consistency, and move to dynamic assessment
  - Collate ‘good practice’ European assessment of adaptation costs, and ex post
  - Transition and indirect costs alongside direct

- To improve benefits assessment
  - Non-market sectors
  - Co-benefits of adaptation (reducing vulnerability to current climate)
  - Distributional aspects
  - How rates and speeds of climate change affect adaptation

- To improve aggregation from local up to regional (or even global)
- To investigate “realistic” adaptation options with different stakeholders
- To examine and present uncertainty, and expand coverage to different climate risks
- While some new studies (ClimateCost), key research focus in Europe