Transformational Climate Science

The future of climate change research following the IPCC Fifth Assessment Report
Working Group II

The challenge and impacts of adaptation

#climate2014
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Climate change: impacts and adaptation

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Europe chapter 23

Sectors
- Infrastructure and settlements
- Food, fisheries, forestry
- Health and wellbeing
- Environmental quality and conservation
Climate change

Policy

Regional climate changes

Adaptation
Health policies

Adaptation [water, food, etc]

Mitigation policies

Health exposures

Income

Health and social impacts
Climate change and ecosystem services

<table>
<thead>
<tr>
<th>Sum of effects on provisioning services</th>
<th>Alpine</th>
<th>Atlantic</th>
<th>Continental</th>
<th>Northern</th>
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<th>Sum of effects on regulating services</th>
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<table>
<thead>
<tr>
<th>Sum of effects on cultural services</th>
<th>Alpine</th>
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<td>˅ (3)</td>
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</tr>
</tbody>
</table>

(N) = number of journal papers
Extreme weather and multiple risks

- 2003 Heat wave, central Europe
  - Hottest summer in at least 500 years
  - Damage to road and rail transport systems.
  - Risk to nuclear power generation in France.
  - Grain harvest losses of 20%
  - 35,000 deaths in August in Central and Western Europe
  - Decline in water quality associated with low river flows
  - Air pollution episode
  - Forest fires (“mega fire”)}
  - Damage to habitats

Source: Table 23-1: Multi-sectoral impacts of climate extremes during the last decade in Europe
Moscow 06/08/2010

http://www.netlore.ru/smog_v_moskve
Climate-risk maps

- Indicators
  - Exposure
  - Vulnerability
- Climate-related risks
  - heat stress
  - Infectious diseases
- Better validation of indicators.
- Need quantification of impacts in terms of burden of disease
- Need baseline estimates of current burdens.

Eritrea - temperatures below 18 deg C in the highlands reduce malaria transmission

Source: IRI
Data and monitoring

- Lack of long term high quality health and demographic data in low and middle income countries
  - Lack of data on poor urban populations
- Linkage with environmental exposures
- Scaling up and down

- Nouna Health and Demographic Surveillance System (HDSS), Burkina Faso
Social impacts

• Need more quantitative evidence
  – Social impacts of disasters/extreme events

• How to scale up from small scale qualitative studies in a regional assessment.

• Loss of cultural landscapes
  – Impacts on wine production
### Table 23-6: Examples of Limits to Adaptation in Europe

<table>
<thead>
<tr>
<th>Area/Location</th>
<th>System</th>
<th>Adaptation measures</th>
<th>Limits to adaptation measure(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, Northern and Continental Europe.</td>
<td>Arable crops</td>
<td>Sowing date as agricultural adaptation</td>
<td>Other constraints (e.g. frost) limit farmer behaviour</td>
</tr>
<tr>
<td>Agriculture, Northern and Continental Europe.</td>
<td>Arable crops</td>
<td>Irrigation</td>
<td>Groundwater availability, competition with other users.</td>
</tr>
<tr>
<td>Agriculture, Northern and Continental Europe.</td>
<td>High value crops</td>
<td>Change distribution</td>
<td>Legislation on cultivar and geographical region</td>
</tr>
<tr>
<td>Conservation Cultural landscapes</td>
<td>Alpine meadow/</td>
<td>Extend habitat</td>
<td>No technological adaptation option.</td>
</tr>
<tr>
<td>Conservation of species richness</td>
<td>Movement of species</td>
<td>Extend habitat</td>
<td>Landscape barriers and absence of climate projections in selection of conservation areas.</td>
</tr>
<tr>
<td>Forests</td>
<td>Movement of species and productivity reduction</td>
<td>Introduce new species</td>
<td>Not socially acceptable, Legal barriers to non-native species</td>
</tr>
</tbody>
</table>
Mitigation and Adaptation synergies and trade-offs

Health effects

• Positive benefits
  – Air quality
  – Active transport
  – Diet
• Negative effects/harms
  – Housing

Biodiversity: example
Inter-disciplinary research

**Funders**
- Long term investment and planning
- New mechanisms of funding
- Investment in data collection

**LWEC examples**
- ESPA - Ecosystem Services for Poverty Alleviation
- ESEI – Environmental and Social Ecology of Human Infectious Diseases
What we did well..

• Integration with WGI
• Intra-regional distribution of impacts
• Impacts at 2-4 degrees
• Detection and attribution in ecological systems
• Health impacts in high income countries
• Geographical inequality

What we did not do well..

• Integration with WGIII
• Inter-regional effects (globalization).
• Impacts at 4+ degrees
• Detection and attribution in human systems.
• Health impacts in low income countries
• Social inequality (distribution within populations)