Climate change and Human health

presented by
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Changes in physical and biological systems

IPCC (2007), Summary for policy makers, working group 2

Bettina Menne, 2 October, 2007
Schematic diagram of pathways by which climate change affects health

- Climate change
  - Environmental conditions
    - Social conditions ('upstream' determinants of health)
      - Direct exposures
      - Indirect exposures (through changes in water-, air-, food quality; vector ecology; ecosystems, agriculture, industry and settlements)
    - Social & economic disruption
  - Health system conditions

Health impacts

*Modifying influence
Emerging evidence of climate change effects
Current Ae. Albopictus distribution

With permission from Schaffner et al,
Cronology of an epidemic

21 June
First imported case to Castiglione di Cervia from India

23 June
First case develops symptoms of Chikungunya

4 July
First case of Chikungunya in a locally resident person

29 August
Established surveillance system. Serological analysis confirms Chikungunya

18 August
Start of disinfection of public areas and information to people on how to protect themselves

3rd week in August
Epidemic peak

13 September
254 cases. 79 laboratory confirmed. Age between 1-95 anni. 52% females.
The example of the heat-wave in 2003

Graphique n°1 : Nombre de décès journaliers à Paris et températures minimales et maximales entre le 26 juin et le 19 août 2003

Paris Funeral Services (2003)
They got what they did not have before

(Klinenberg...)

... cooling and medical attention.....
## Direction and magnitude of change of selected health impacts of climate change

<table>
<thead>
<tr>
<th>Negative Impact</th>
<th>Positive Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Very High Confidence</strong></td>
<td></td>
</tr>
<tr>
<td><em>Malaria: Contraction and expansion, changes in transmission season</em></td>
<td></td>
</tr>
<tr>
<td><strong>High Confidence</strong></td>
<td></td>
</tr>
<tr>
<td><em>Increase in malnutrition</em></td>
<td></td>
</tr>
<tr>
<td><em>Increase in the number of people suffering from deaths, disease and injuries from extreme weather events</em></td>
<td></td>
</tr>
<tr>
<td><em>Increase in the frequency of cardio-respiratory diseases from changes in air quality</em></td>
<td></td>
</tr>
<tr>
<td><em>Change in the range of infectious disease vectors</em></td>
<td></td>
</tr>
<tr>
<td><em>Reduction of cold-related deaths</em></td>
<td></td>
</tr>
<tr>
<td><strong>Medium Confidence</strong></td>
<td></td>
</tr>
<tr>
<td><em>Increase in the burden of diarrheal diseases</em></td>
<td></td>
</tr>
</tbody>
</table>

Bettina Menne, 2 October, 2007
Table SPM-1. Illustrative examples of global impacts projected for climate changes (and sea-level and atmospheric carbon dioxide where relevant) associated with different amounts of increase in global average surface temperature in the 21st century [T20.7]. The black lines link impacts, dotted arrows indicate impacts continuing with increasing temperature. Entries are placed so that the left hand side of text indicates approximate onset of a given impact. Quantitative entries for water scarcity and flooding represent the additional impacts of climate change relative to the conditions projected across the range of Special Report on Scenarios (SRES) scenarios A1FI, A2, B1 and B2 (see Endbox 3). Adaptation to climate change is not included in these estimations. All entries are from published studies recorded in the chapters of the Assessment. Sources are given in the right hand column of the Table. Confidence levels for all statements are high.

Bettina Menne, 2 October, 2007
Two questions

• Which are the co-benefits or collateral damages of climate change related policies, measures and strategies? Thus what can be safely promoted?

• What measures (adaptation) need to be strengthened and what additional measures, policies and strategies are needed?
Sectorial IPCC proposals

- **Energy Supply**
  - Improved supply and distribution efficiency; fuel switching from coal to gas; nuclear power; renewable heat and power (hydropower, solar, wind, geothermal and bioenergy); combined heat and power; early applications of CCS (e.g. storage of removed CO2 from natural gas)
  - Carbon Capture and Storage (CCS) for gas, biomass and coal-fired electricity generating facilities; advanced nuclear power; advanced renewable energy, including tidal and waves energy, concentrating solar, and solar PV.

- **Transport**
  - More fuel efficient vehicles; hybrid vehicles; cleaner diesel vehicles; biofuels; modal shifts from road transport to rail and public transport systems; non-motorised transport (cycling, walking); land-use and transport planning
  - Second generation biofuels; higher efficiency aircraft; advanced electric and hybrid vehicles with more powerful and reliable batteries

- **Buildings**
  - Efficient lighting and daylighting; more efficient electrical appliances and heating and cooling devices; improved cook stoves, improved insulation; passive and active solar design for heating and cooling; alternative refrigeration fluids, recovery and recycle of fluorinated gases
  - Integrated design of commercial buildings including technologies, such as intelligent meters that provide feedback and control; solar PV integrated in buildings
All sectors have the potential to contribute

Note: estimates do not include non-technical options, such as lifestyle changes.

IPCC (2007), Summary for policy makers, working group 3
Health effects from electricity generation

Figure 3: Health effects of electricity generation per TWh
(A) deaths from air pollution and accidents involving workers or the public; (B) cases of serious illness attributed to air pollution. Data for CO\textsubscript{2} equivalent emissions from IAEA, 2001.\textsuperscript{40}

Markandya and Wilkinson, 2007
Globally, there are each year roughly
• 1.2 million deaths due to road traffic injuries
• 800,000 deaths due to urban air pollution.
• 1.9 million deaths ascribed to physical inactivity.
### Solutions are available

<table>
<thead>
<tr>
<th>Policy</th>
<th>Reducing crashes</th>
<th>Reducing air pollution</th>
<th>Reducing noise</th>
<th>Mitigating climate change</th>
<th>Promoting physical activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed management</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Traffic calming and speed reduction in residential areas</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Reducing transport demand (such as by telecommunication)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Road pricing</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Cleaner fuels and more efficient vehicles</td>
<td>/</td>
<td>+</td>
<td>/</td>
<td>+</td>
<td>/</td>
</tr>
<tr>
<td>Promotion of safe cycling, walking and public transport</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Safer cars (including fronts protecting pedestrians)</td>
<td>+</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>Implementing noise reduction barriers</td>
<td>/</td>
<td>/</td>
<td>+</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>Investment in safe infrastructure for cyclists and pedestrians</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Urban parking management</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Environmentally differentiated fees for motorized transport in urban areas</td>
<td>/</td>
<td>+</td>
<td>/</td>
<td>+</td>
<td>/</td>
</tr>
<tr>
<td>Reducing the power of vehicles</td>
<td>+</td>
<td>+</td>
<td>/</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

*Adapted from Racioppi, et al, 2004*
Biomass fuels in households are responsible annually for approximately 0.7 to 2.1 million premature deaths in low-income countries.
Long term mitigation (after 2030)

• Mitigation efforts over the next two to three decades will have a large impact on opportunities to achieve lower stabilization levels

<table>
<thead>
<tr>
<th>Stab level (ppm CO2-eq)</th>
<th>Global Mean temp. increase at equilibrium (°C)</th>
<th>Year CO2 needs to peak</th>
<th>Year CO2 emissions back at 2000 level</th>
<th>Reduction in 2050 CO2 emissions compared to 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>490 – 535</td>
<td>2.4 – 2.8</td>
<td>2000 - 2020</td>
<td>2000- 2040</td>
<td>-60 to -30</td>
</tr>
<tr>
<td>535 – 590</td>
<td>2.8 – 3.2</td>
<td>2010 - 2030</td>
<td>2020- 2060</td>
<td>-30 to +5</td>
</tr>
<tr>
<td>590 – 710</td>
<td>3.2 – 4.0</td>
<td>2020 - 2060</td>
<td>2050- 2100</td>
<td>+10 to +60</td>
</tr>
<tr>
<td>710 – 855</td>
<td>4.0 – 4.9</td>
<td>2050 - 2080</td>
<td></td>
<td>+25 to +85</td>
</tr>
<tr>
<td>855 – 1130</td>
<td>4.9 – 6.1</td>
<td>2060 - 2090</td>
<td></td>
<td>+90 to +140</td>
</tr>
</tbody>
</table>

IPCC (2007), Summary for policy makers, working group 3
How much disease could be prevented by modifying the environment?

Current evidence - best conservative estimate 24%

Pruess-Austin and Corvalan, WHO, 2006
Additional adaptation: approaches at different scales and across scales

- **International:**
  - Global climate related infectious disease surveillance;
  - Regional early warning mechanisms and actions for the health sector;
  - Inclusion of climate change into multilateral agreements
- **National and regional:**
  - Early warning systems linked to intervention plans (heat and infectious diseases);
  - Specific disease risk identification and surveillance;
  - Specific awareness programs;
  - Inclusion of climate change into risk management mechanisms
- **Health sector:**
  - Health system response plans; training of health professionals; climate proofed infrastructure
- **Individual:**
  - Information about solutions (e.g. heat in summer)
- **Across scales: win-win approaches**
  - Climate proofed housing
“Collective action is more likely than piecemeal initiative to advance policy and practice”  (Dr Chan, 2007)
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