The Challenge for Adaptation:
The Legacy from Copenhagen

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THE 2007 IPCC MESSAGE FOR ADAPTATION WAS VERY CLEAR:

1. Significant impacts are closer than we thought,
   So: the ‘window’ for adaptation is smaller than we thought.

2. The net impact will be profoundly negative,
   So: could be very costly if not avoided

3. Even the strongest action on emissions would not avoid significant impacts
   So: we need adaptation just as much as mitigation
IPCC 2007 indicated main projected impacts would likely be:

- On water availability
- On food supply
- On human health
- On threats to settlement from coastal flooding
Most key impacts stem from reduced water availability.

Changes in run-off, 21st century. White areas are where less than two-thirds of models agree, hatched are where 90% of models agree (IPCC SYR)
Suitability for rain-fed cereals (reference climate, 1961-90).

Change in suitability for rain-fed cereals (HadCM3-A1FI, 2080s)
Increase in potential for disease and hunger

<table>
<thead>
<tr>
<th></th>
<th>Negative impact</th>
<th>Positive impact</th>
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<tbody>
<tr>
<td><strong>Very high confidence</strong></td>
<td>Malaria: contraction and expansion, changes in transmission season</td>
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<tr>
<td><strong>High confidence</strong></td>
<td>Increase in malnutrition</td>
<td>Increase in the number of people suffering from deaths, disease and injuries from extreme weather events</td>
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<td>Increase in the frequency of cardio-respiratory diseases from changes in air quality</td>
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<td>Change in the range of infectious disease vectors</td>
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<td>Reduction of cold-related deaths</td>
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<td><strong>Medium confidence</strong></td>
<td>Increase in the burden of diarrhoeal diseases</td>
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Red arrows indicate negative impacts, blue arrows indicate positive impacts.
Densely populated “megadeltas” especially in Asia and Africa, are most at risk.
IPCC AR4 concluded
People will be most at risk in:

• **Most vulnerable regions:**
  – Africa, Asian mega-deltas, small islands, the Arctic

• **Most vulnerable sectors:**
  – water in the dry tropics
  – agriculture in low latitudes
  – human health in all regions
  – sensitive or stressed ecosystems: eg tundra, boreal, mountains, mangroves, coral reefs.

In all countries:
- the poor, young children, the elderly, the marginalised.
What support for adaptation have we so far agreed?
UN estimates for costs of adaptation (annually, by 2030)

- Agriculture: $14bn
- Water: $11bn
- Human health: $5bn
- Infrastructure: $8 bn (to $130bn pa)
- Coasts: $11 bn

**TOTAL:** $50 bn (to $170 bn)

(ecosystems excluded)
Copenhagen Accord agreed:

to mobilize $100 bn annually by 2020;

...... probably with c. one-half ($50bn pa) to be spent on adaptation.
What level of protection would this pay for in adaptation?

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost</th>
<th>Temperature</th>
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<tbody>
<tr>
<td>Agriculture</td>
<td>$14bn</td>
<td>1.5 deg C</td>
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<td>Global mean annual temperature relative to pre-industrial</td>
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<td>About 20 to 30% species at increasingly high risk of extinction</td>
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<td>Most corals bleached</td>
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<td>Widespread coral mortality</td>
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<td>Crop productivity</td>
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Global mean annual temperature change relative to 1980-1999 (°C)
Emissions cuts pledged at Copenhagen

- Emission peak 2035; T peaks 2100 at c. 3 deg C

Global mean annual temperature change relative to 1980-1999 (°C)

- WATER
  - Increased water availability in moist tropics and high latitudes
  - Decreasing water availability and increasing drought in mid-latitudes and semi-arid low latitudes
  - 0.4 to 1.7 billion
  - 1.0 to 2.0 billion
  - 1.1 to 3.2 billion
  - Additional people with increased water stress

- ECOSYSTEMS
  - Increasing amphibian extinction
  - About 20 to 30% species at increasingly high risk of extinction
  - Increased coral bleaching
  - Most corals bleached
  - Widespread coral mortality
  - Increased species range shifts and wildfire risk
  - Terrestrial biosphere tends toward a net carbon source, as: ~15%
  - ~40% of ecosystems affected

- FOOD
  - Crop productivity
  - Low latitudes: Decreases for some cereals
  - Increases for some cereals
  - Mid to high latitudes
  - All cereals decrease
  - Decreases in some regions

- COAST
  - Increased damage from floods and storms
  - Additional people at risk of coastal flooding each year: 0 to 3 million
  - About 30% loss of coastal wetlands
  - 2 to 15 million

- HEALTH
  - Increasing burden from malnutrition, diarrhoeal, cardio-respiratory and infectious diseases
  - Increased morbidity and mortality from heatwaves, floods and droughts
  - Changed distribution of some disease vectors
  - Substantial burden on health services

- SINGULAR EVENTS
  - Local retreat of ice in Greenland and West Antarctica
  - Long term commitment to several metres of sea level rise due to ice sheet loss
  - Leading to reconfiguration of coastlines worldwide and inundation of low-lying areas
  - Ecosystem changes due to weakening of the meridional overturning circulation
Likely outcome for current pledges

- Financed adaptation
- Impacts not avoided

Global mean annual temperature change relative to 1980-1999 (°C)

- Global mean annual temperature relative to pre-industrial
- Unmitigated climate change impacts in 2100

1. Increased water availability in moist tropics and high latitudes
   Decreasing water availability and increasing drought in mid-latitudes and semi-arid low latitudes
   - 0.4 to 1.7 billion
2. Increasing amphibian extinction
   - About 20 to 30% species at increasing high risk of extinction
   - Major extinctions around the globe
3. Increased coral bleaching
   - Most corals bleached
   - Widespread coral mortality
   - ~40% of ecosystems affected
4. Impacts not avoided
   - Ecosystem changes due to weakening of the meridional overturning circulation
   - Leading to reconfiguration of coastlines world wide and inundation of low-lying areas

- Additional people with increased water stress
- More people with increased flooding
- All cereals decrease

- Increased burden from malnutrition, diarrhoeal, cardio-respiratory and infectious diseases
- Increased morbidity and mortality from heatwaves, floods and droughts
- Substantial burden on health services

- Local retreat of ice in Greenland and West Antarctic
- Long term commitment to several metres of sea level rise due to ice sheet loss

- Crop productivity
- Disruption of food production
- Increased risk to some cereals
- Mid to high latitudes
- All crops decrease

- Damage from floods and storms
- Additional people at risk of coastal flooding each year

- Unmitigated climate change impacts in 2100

- Global mean annual temperature relative to pre-industrial
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• Need to be clear about the goals of adaptation (maintain status quo vs achieve the least cost option?)
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• What are the main institutional, and technical and biological barriers to implementation?....and how to overcome them?

• And how can we pay for adaptation: both accessing the funds ............and spending them wisely, eg integrating adaptation into sustainable development
Thank you....

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