Climate Change and Increasing Risks in Urban Areas

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Weather-related events occur on time scales of today to the next decades – each bringing a set of hazards.
### Distribution of natural disasters: by origin
(1900-2003, by decades*)

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrometeorological</td>
<td>28</td>
<td>75</td>
<td>56</td>
<td>74</td>
<td>128</td>
<td>280</td>
<td>511</td>
<td>795</td>
<td>1575</td>
<td>2139</td>
<td>1444</td>
<td>7105</td>
</tr>
<tr>
<td>Geological</td>
<td>36</td>
<td>26</td>
<td>32</td>
<td>38</td>
<td>53</td>
<td>58</td>
<td>94</td>
<td>128</td>
<td>234</td>
<td>283</td>
<td>152</td>
<td>1134</td>
</tr>
<tr>
<td>Biological</td>
<td>5</td>
<td>12</td>
<td>10</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>40</td>
<td>65</td>
<td>167</td>
<td>351</td>
<td>297</td>
<td>956</td>
</tr>
<tr>
<td>Total</td>
<td>69</td>
<td>113</td>
<td>98</td>
<td>115</td>
<td>184</td>
<td>341</td>
<td>645</td>
<td>988</td>
<td>1976</td>
<td>2773</td>
<td>1693</td>
<td>9195</td>
</tr>
</tbody>
</table>

*Note: *Changes in the definitions may affect the comparison of the data across decades. The largest region in terms of insurance losses is Asia.
The upward trend has been most dramatic for hydrometeorological (weather-related) events.
Floods – 33%
Storms – 23%
Droughts – 15%
Why the increasing trends?

• More people and more complex societies
  – Great concentrations of people in urban areas
• More structure – much of its aging
  – Particularly in urban areas
• Choices – where to live, work, play and travel
  – Urbanization of societies – most along coasts and rivers
• Human intervention in the environment
  – Emission of pollutants and greenhouse gases
Natural and human events interact on time scales of today to the next decades.
Human intervention – climate change
Kyoto Protocol starts the process of stabilizing GHG concentrations.
But the climate will be changing, at least for the next century.
Land areas are projected to warm more than the oceans with the greatest warming at high latitudes.

Annual mean temperature change, 2071 to 2100 relative to 1990: Global Average in 2085 = 3.1°C
Some areas are projected to become wetter, others drier with an overall increase projected.

Annual mean precipitation change: 2071 to 2100 Relative to 1990.
Risk from Extreme events
Dr. R. Watson – Chair of IPCC speaking to COP 6

“The overwhelming majority of scientific experts, whilst recognizing that scientific uncertainties exist, nonetheless believe that human-induced climate change is inevitable. … the frequency and magnitude of these type of events: heat waves, floods, droughts, fires and extreme weather events leading to significant economic losses and loss of life, are predicted to increase in a warmer world”
### IPCC Assessment

<table>
<thead>
<tr>
<th>Confidence in observed changes (latter half of the 20th century)</th>
<th>Changes in Phenomenon</th>
<th>Confidence in projected changes (during the 21st century)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hotter days</strong></td>
<td>Higher maximum temperatures and more hot days over nearly all land areas</td>
<td>Very likely</td>
</tr>
<tr>
<td></td>
<td>Higher minimum temperatures, fewer cold days and frost days over nearly all land areas</td>
<td>Very likely</td>
</tr>
<tr>
<td></td>
<td>Reduced diurnal temperature range over most land areas</td>
<td>Very likely</td>
</tr>
<tr>
<td></td>
<td>Increase of heat index(^8) over land areas</td>
<td>Very likely, over most areas</td>
</tr>
<tr>
<td><strong>Less cold</strong></td>
<td>More intense precipitation events(^b)</td>
<td>Very likely, over many areas</td>
</tr>
<tr>
<td>Hemispheric mid- to high latitude land areas</td>
<td>Increased summer continental drying and associated risk of drought</td>
<td>Likely, over most mid-latitude continental interiors (Lack of consistent projections in other areas)</td>
</tr>
<tr>
<td>Likely, in a few areas</td>
<td>Increase in tropical cyclone peak wind intensities(^c)</td>
<td>Likely, over some areas</td>
</tr>
<tr>
<td>Not observed in the few analyses available</td>
<td>Increase in tropical cyclone mean and peak precipitation intensities(^c)</td>
<td>Likely, over some areas</td>
</tr>
<tr>
<td>Insufficient data for assessment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• Increased mortality in old people in urban areas
The Human Toll of Heat Waves: Selected Examples from Europe in August 2003

<table>
<thead>
<tr>
<th>Country</th>
<th>Deaths</th>
<th>Other Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>14,802</td>
<td>40C Paris highest records began in 1873.</td>
</tr>
<tr>
<td>Germany</td>
<td>7,000</td>
<td>41C hottest since records began in 1901</td>
</tr>
<tr>
<td>Spain</td>
<td>4,230</td>
<td>High T + ozone &gt; EU health-risk threshold.</td>
</tr>
<tr>
<td>Italy</td>
<td>4,175</td>
<td>Increase 9C previous year.</td>
</tr>
<tr>
<td>U. K.</td>
<td>2,045</td>
<td>First 38C recorded in London.</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1,400</td>
<td>8C warmer than normal.</td>
</tr>
<tr>
<td>Portugal</td>
<td>1,316</td>
<td>&gt; 40C throughout much of the country.</td>
</tr>
<tr>
<td>Belgium</td>
<td>150</td>
<td>highest T since records began in 1833.</td>
</tr>
</tbody>
</table>

TOTAL OF ABOVE COUNTRIES 35,118
### IPCC Assessment

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<td>Range over most land areas</td>
<td>Increase of heat index(^8) over land areas</td>
<td>Very likely, over most areas</td>
</tr>
<tr>
<td>More intense precipitation events(^b)</td>
<td>Very likely, over many areas</td>
<td></td>
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<tr>
<td>Increased summer continental drying and associated risk of drought</td>
<td>Likely, over most mid-latitude continental interiors (Lack of consistent projections in other areas)</td>
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</table>

- **Floods, land slides, mudslides**: impacts - people, property, costs
- **Intense Precipitation**: 90-99%
- **Drought**: 66-90%
- **Tropical Cyclones**: impacts – people, economic systems, property, ecology
- **drinking water, agricultural productivity, hydropower**: wildfires
Sea level rise will amplify the threats due to storm surges and coastal flooding.

“It (climate change) could even threaten survival in small island States and in low-lying coastal, arid and semi-arid areas”

Ministerial Declaration – Second World Climate Conference
Vulnerability of urban areas

• Will increase due to risks from weather-related events.
• Future design criteria – not on the past but on the best estimates of future conditions.
• The Precautionary Principle
  – Reaffirmed in at WSSD – Johannesburg, 2002
Focus: Preventing natural hazards becoming natural disasters

• “There is no role more fundamental for government than the protection of its citizens.”
  • Canadian Government Speech From the Throne – 2/2/2004
• “Global warming poses a greater long-term threat to humanity than terrorism.”
  • Canadian Environment Minister D. Anderson, 6/Feb/2004
• “Unchecked climate change has the potential to be catastrophic in both human and economic terms”
  • Prime Minister Blair – UK Sept/04
Hazard warning systems

• Should become the keystone of governmental and international systems.

• Provide predictions of weather and weather-related events
  – on minutes-hours for tornadoes, flash floods and storm surges,
  – on a day-to-day basis for hurricanes and mid-latitude storms, and
  – on a seasonal and longer-term basis as input to planning.

• Predictions need to be seen in the context of this continuum of time, each with appropriate policy responses.
Responding to Hazards

ANTICIPATE through Forecasts and warnings – short time scale

**Hazard**

- **PREDICTION**
  - Warnings
  - Information
  - Advice
  - Warnings need to be timely

**IMPACTS**

**Responses**

**Actions to reduce the impacts**

Failure - DISASTER
Responding to Hazards  Anticipate - Adaptation-Mitigation – predictions on short to long time scales

- PREDICTION
- IMPACTS
- ADAPTATION
- MITIGATION
- On longer time scales

Failure - DISASTER

Change the Hazard
Reduce the impacts

Warnings
Information
Advice
Public education and communication.

• A warning not heard, or, if heard, not appropriately acted upon, does not save lives and reduce damage and is a waste of resources.

• Public education is needed to advise people of how and when to respond to messages of impending events. People need to be advised on the appropriate actions.

• Communications system need be in place to warn people. These should be tailored to the local population: what works?
National meteorological-hydrological services

- Already exist to provide these services.
- Need support and augmentation
- Broaden the scope to all natural hazards – and appropriate technological hazards
- Working together internationally can help to provide the best services on a local basis.
Approaches to Disaster Management

- **Response and recovery**
- **Preparedness**
- **Mitigation**
  - **ANTICIPATE through Forecasts and warnings**
    - advise people about impending events and advise on response strategy
      - examples: floods, seasonal drought; climate change
  - **CHANGE PRACTICES**
    - adopt standards and codes to protect infrastructure, people, etc., from “reasonable” extremes
      - examples: building codes;

Although analysis shows that investment in prevention pay off, most government $ are still in RECOVERY
International and national assistance programs

• Need to include prevention as well as response and recovery components.

• Climate change, balance between
  – emission reductions; and
  – adaptation
    • (actions to reduce the impacts of a changing climate).
The Delhi (CoP8) Ministerial Declaration on Climate Change and Sustainable Development

“Adaptation to the adverse effects of climate change is of high priority for all countries. Developing countries are particularly vulnerable, especially the least developed countries and small island developing States. Adaptation requires urgent attention and action on the part of all countries.”
An integrated approach to human development

- Hazard mitigation
- Climate change
- Risk Management

Sustainable Development
Poverty eradication
Global Security
The End

Thank you for your attention