Risk Management and Climate Change
El Niño case in 2010

Dr Royol CHITRADON
Hydro and Agro Informatics Institute (HAIi)
Ministry of Science and Technology Thailand
Tropical Cyclone Disasters

Death toll from extreme tropical cyclones

- 1737 Calcutta cyclone (India)
- 1786 Great Backerganj Cyclone (Bangladesh)
- 1839 Indian cyclone
- 1881 Haiphong Typhoon (Vietnam)
- 1882 Bombay cyclone (India)
- 1864 Calcutta Cyclone (India)
- 1911 Bangladesh cyclone
- 1970 Bhola cyclone (Bangladesh)
- 1975 Super Typhoon Nina (China)
- 1991 Bangladesh cyclone
- 2008 Cyclone Nargis (Myanmar)
- 1922 Swatow Typhoon (China)

More frequent cyclone (climate change)
1996 Typhoons (La Niña)

Shifted
1997 Typhoons (El Niño)

NW Pacific Tropical Cyclones 1997
Details at http://www.soest.hawaii.edu/Tropical/tropical.html

Shifted
### Pacific Typhoons in 2009

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total depressions</td>
<td>41</td>
</tr>
<tr>
<td>Total storms</td>
<td>22 official, 3 unofficial</td>
</tr>
<tr>
<td>Typhoons</td>
<td>13 official, 2 unofficial</td>
</tr>
<tr>
<td>Super typhoons</td>
<td>5 (unofficial)</td>
</tr>
<tr>
<td>Total fatalities</td>
<td>&gt;2301 total, 240 missing</td>
</tr>
<tr>
<td>Total damage (2009)</td>
<td>$10.836 billion</td>
</tr>
</tbody>
</table>

Considered the worst in decades! (e.g. Ketsana, Parma)

---

**Dense period**
Niño Regions (SST anomalies)

Niño 4: 1.4°C
Niño 3.4: 1.7°C
Niño 3: 1.4°C
Niño 1+2: 0.6°C

Tropical Depression 01W (19 Jan 2010)
SST anomalies 2010 Vs 2005

January 2010

January 2005 (El Niño)
SST departure (Jan 10 – Dec 09)

Change in monthly average Sea Surface Temperature (JAN2009 minus DEC2009)

Locally raising SST
Concluding remarks

- Climate change causes more frequent and severe weather extremes.
- “Unusual” events are becoming “usual”.
- Assessment is based on deterministic instead of stochastic approach.
- Risk management must be based on possible maximum and minimum rather than average values.