Engineering the Global Thermostat!

Part A - Humanity’s Dilemma

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a short history of progress
ronald wright

"Rarely have I read a book that is so gripping, so immediate and so important to our times. Jared Diamond will be jealous!"

Robyn Williams, ABC
Figure 1  1000 years of Northern Hemisphere Temperatures in a Degrees Centigrade. (Gore, 2006)  Note. The last 160 years of temperature records have been measured not inferred.
Figure 4  Vostok time series and Insolation (trace ‘e’ ) relationships to temperature methane (CH4) and carbon dioxide (CO2). (Showing Milanokovitch 100,000 year cycles)
INSOLATION

- INcoming SOLar radiATION = INSOLATION
Predicting the Global Climate

Milutin Milanovitch and James Croll

1. Variations in Earth’s orbital eccentricity – The shape of the elliptical orbit around the Sun
2. Changes in Obliquity – Changes in the angle of the Earth’s axis to the plane of orbit
3. Precession – The change in direction of the Earth’s rotation
Spectral Analysis

- Peaks of periods 23,000; 42,000 & 100,000 year cycles
- These peaks correspond to 10; 25 and 50% of climate variance respectively
- At maximum eccentricity Earth experiences a reduction of about 30% of solar energy
Spectral Analysis and Holocene Temperature
Figure 6. Orbiting the Sun. Long term variations of eccentricity (top), June insolation at 65° N (middle), and simulated Northern Hemisphere ice volume (increasing downward) (bottom) for 200,000 years before the present time to 130,000 from now.

Heavenly Bodies at Work!
Table 1  IPCC Summary table showing mitigation categories, temperature rise, sea level rise and corresponding CO2 –– equivalents.

<table>
<thead>
<tr>
<th>Category</th>
<th>CO₂ concentration at stabilization (2005 = 379 ppm)</th>
<th>CO₂-equivalent Concentration at stabilization including GHGs and aerosols (2005 = 375 ppm)</th>
<th>Peaking year for CO₂ emissions (\textsuperscript{a,c})</th>
<th>Change in global CO₂ emissions in 2050 (% of 2000 emissions) (\textsuperscript{a,c})</th>
<th>Global average temperature increase above pre-industrial at equilibrium, using “best estimate” climate sensitivity (\textsuperscript{b,c})</th>
<th>Global average sea level rise above pre-industrial at equilibrium from thermal expansion only (\textsuperscript{f})</th>
<th>Numbe r of assessed scenarios</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>350 – 400</td>
<td>445 – 490</td>
<td>2000 – 2015</td>
<td>-85 to -50</td>
<td>2.0 – 2.4</td>
<td>0.4 – 1.4</td>
<td>6</td>
</tr>
<tr>
<td>II</td>
<td>400 – 440</td>
<td>490 – 535</td>
<td>2000 – 2020</td>
<td>-60 to -30</td>
<td>2.4 – 2.8</td>
<td>0.5 – 1.7</td>
<td>18</td>
</tr>
<tr>
<td>III</td>
<td>440 – 485</td>
<td>535 – 590</td>
<td>2010 – 2030</td>
<td>-30 to +5</td>
<td>2.8 – 3.2</td>
<td>0.6 – 1.9</td>
<td>21</td>
</tr>
<tr>
<td>IV</td>
<td>485 – 570</td>
<td>590 – 710</td>
<td>2020 – 2060</td>
<td>+10 to +60</td>
<td>3.2 – 4.0</td>
<td>0.6 – 2.4</td>
<td>118</td>
</tr>
<tr>
<td>V</td>
<td>570 – 660</td>
<td>710 – 855</td>
<td>2050 – 2080</td>
<td>+25 to +85</td>
<td>4.0 – 4.9</td>
<td>0.8 – 2.9</td>
<td>9</td>
</tr>
<tr>
<td>VI</td>
<td>660 – 790</td>
<td>855 – 1130</td>
<td>2060 – 2090</td>
<td>+90 to +140</td>
<td>4.9 – 6.1</td>
<td>1.0 – 3.7</td>
<td>5</td>
</tr>
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</table>
Table 2 shows the ‘Key Finding’ on the Pathways towards Stabilisation (IPCC, 2007b). Mitigation efforts over the next two to three decades will have a large impact on opportunities to achieve lower stabilisation level. (IPCC, 2007b)

<table>
<thead>
<tr>
<th>Stabilization level (ppm CO₂-equ)</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>
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<td>490 – 535</td>
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What does 1 degree mean?

Each chapter represents a specific degree of heat. i.e.

chapter 1 = 1 degree

....

chapter 6 = 6 degrees
Chancellor Merkel’s advisor -
Dr Hans Joachim Schellnhuber Director Potsdam Climate Impact Research

- Germany aims to confine Global warming to 2°C
- Official European Union goal 2°C to avoid ‘dangerous’ climate change
- We cannot be sure but must avoid tipping points which could be unmanageable
- 2°C a different World but keep chaos at bay
- Germany & UK to reduce emissions by 80% by 2050 and US by 90% to 1990 values
- i.e. Germany 40% by 2020
CONCLUSION

That unless there is a demonstrated WILL by the nations of the world to drastically reduce carbon dioxide emissions within a very short time-frame the world community will have to consider desperate measures if billions of people are not to perish and the species is to survive.

A two pronged approach will be essential to avoid this latter scenario. Both the carbon dioxide emissions must be reduced as quickly as possible and measures taken to reduce the Insolation particularly in the next 20 to 30 years.