Key findings of the 5th Assessment Report of the IPCC

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CHIESA 3rd Annual Project Meeting Program 24–25 March 2014
at the ICIPE Duduville Campus in Nairobi, Kenya
Background on IPCC

• The Intergovernmental Panel on Climate Change (IPCC) was first established in 1988 by two United Nations organizations, the World Meteorological Organization (WMO) and the United Nations Environment Program (UNEP) at the request of a number of nations.
• It is the accepted global authority on climate change and produces reports that are collectively agreed assessments of the scientific literature by leading researchers.

(source: www.ipcc.ch)
Role of IPCC

• The IPCC does not carry out any research nor monitors climate related data or other relevant parameters.
• Its report is an assessment that collects and summarises current knowledge in relation to climate change.
• IPCC bases its assessment mainly on peer-reviewed and published scientific/technical literature and unreviewed (grey) sources.
• It is considered the leading review globally of climate change and is produced by a team of hundreds of scientists and specialists from a diverse range of disciplines.

(source: www.ipcc.ch)
IPCC Reports

IPCC had produced 5 Assessment Reports plus several other special reports including the recently released SREX & SRREN.
The Fifth Assessment Report (AR5) Process

Key areas being examined in the AR5:

- The physical science - Working Group I (September 2013)
- Impacts vulnerabilities and adaptation - Working Group II (March 2014)
- Mitigation options scenarios - Working Group III (April 2014)
The Fifth Assessment Report (AR5)

- The Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC) released on Sept 27, 2013, in Stockholm, Sweden, is the most detailed assessment of climate change ever.

- AR5 is based on more data, contains more detailed regional projections and is more confident about its conclusions than any global assessment to date.
Summary of the Key Findings

• Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia.

• The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased.

• Human influence on the climate system is clear.
Human Activities and Climate Change

- Human Activities
  - Emissions
    - Atmospheric Concentrations
      - Radiative Forcing
        - Climate Change
# Radiative Forcings

<table>
<thead>
<tr>
<th>Emitted compound</th>
<th>Resulting atmospheric drivers</th>
<th>Radiative forcing by emissions and drivers</th>
<th>Level of confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂</td>
<td>CO₂</td>
<td>1.68 [1.33 to 2.03]</td>
<td>VH</td>
</tr>
<tr>
<td>CH₄</td>
<td>CO₂, H₂O, O₃, CH₄</td>
<td>0.97 [0.74 to 1.20]</td>
<td>H</td>
</tr>
<tr>
<td>Halocarbons</td>
<td>O₃, CFCs, HCFCs</td>
<td>0.18 [0.01 to 0.35]</td>
<td>H</td>
</tr>
<tr>
<td>N₂O</td>
<td>N₂O</td>
<td>0.17 [0.13 to 0.21]</td>
<td>VH</td>
</tr>
<tr>
<td>CO</td>
<td>CO₂, CH₄, O₃</td>
<td>0.23 [0.16 to 0.30]</td>
<td>M</td>
</tr>
<tr>
<td>NMVOC</td>
<td>CO₂, CH₄, O₃</td>
<td>0.10 [0.05 to 0.15]</td>
<td>M</td>
</tr>
<tr>
<td>NOₓ</td>
<td>Nitrate, CH₄, O₃</td>
<td>-0.15 [-0.34 to 0.03]</td>
<td>M</td>
</tr>
<tr>
<td>Aerosols and precursors (Mineral dust, SO₄, NH₃, Organic carbon and Black carbon)</td>
<td>Cloud adjustments due to aerosols</td>
<td>-0.27 [-0.77 to 0.23]</td>
<td>H</td>
</tr>
<tr>
<td>Natural</td>
<td>Changes in solar irradiance</td>
<td>0.05 [0.00 to 0.10]</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total anthropogenic RF relative to 1750</th>
</tr>
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<tbody>
<tr>
<td>2011</td>
</tr>
<tr>
<td>1980</td>
</tr>
<tr>
<td>1950</td>
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</table>
Climate Change Concept: Change in mean, frequency and magnitude
Key Findings

- Air temperatures over land and ocean surfaces are now higher than 100 years ago across almost the entire globe, and the past three decades are warmer than any decade since 1850. Between 1880 and 2012, globally averaged temperatures increased by 0.85°C.

- Ocean surface waters are much warmer than 100 years ago. The warming is greatest in the upper waters. The upper layer of the ocean is warming at about 0.1°C per decade.

- The past 50 years have seen changes in many extreme weather and climate events. Some areas are experiencing more heatwaves and/or more heavy rainfall events.
• With few exceptions, glaciers worldwide are shrinking. This is also the case for the massive Greenland and Antarctic ice sheets, particularly over the past two decades. The rate of ice loss is increasing.

• Both the extent and thickness of Arctic sea ice have decreased over the past three decades. It is at least 90% certain that the area covered by sea ice shrank 3.5–4.1% per decade in the period 1979–2012.

• The rapid retreat in summer sea ice – 9.4–13.6% per decade – may be unparalleled in the past 1500 years.
• The area covered by snow in the Northern Hemisphere each year has shrunk over the past 50 years, especially in spring. Permafrost is thawing in most regions.

• The Arctic has become substantially warmer over the past 50 years.

• Global mean sea level rose 0.19 m over the period 1901–2010.

• The main causes of sea level rise over the past 50 years are ocean warming (water expands as it warms) and melting glaciers and ice sheets. The rate at which global mean sea level is rising has accelerated over the past 200 years.
Atmospheric levels of the main greenhouse gases (carbon dioxide, methane, nitrous oxide) have all risen since the start of the industrial era.

By 2011, these greenhouse gases had exceeded pre-industrial levels by about 40%, 150% and 20%, (carbon dioxide, methane, nitrous oxide) respectively. Current levels are unprecedented in at least the last 800,000 years.

The oceans have absorbed about 30% of the carbon dioxide emitted by human activities to date. This is causing ocean acidification.
Direct Temperature Observations

[Diagram showing temperature observations across different regions and time periods, with notes on observations and models using natural and anthropogenic forcings.]
Observed change in surface temperature 1901–2012
Each of the last three decades has been successively warmer at the Earth’s surface than any preceding decade since 1850.

In the Northern Hemisphere, 1983–2012 was likely the warmest 30-year period of the last 1400 years (medium confidence).
Increased Acidity

40% increase since pre-industrial period

Ocean absorbed 30% of these emitted CO2

Ocean becoming more acidic
• Wetter region gets more wetter and drier gets more drier since the second half of the 20th century.

• Extreme weather & climate events became more frequent.
Heavy precipitation events: Increase in the frequency, intensity, and/or amount of heavy precipitation.

Increases in intensity and/or duration of drought.

Increases in intense tropical cyclone activity.

Increased incidence and/or magnitude of extreme high sea level.

Warmer and/or more frequent hot days and nights over most land areas.

Warm spells/heat waves. Frequency and/or duration increases over most land areas.

Warmer and/or fewer cold days and nights over most land areas.
SOME FEW EXAMPLES OF CLIMATE IMPACTS
Local Scale Human Activities and Land Cover Changes affect climate

OVER STOCKING

FOREST FIRE

FUEL WOOD

CHARCOAL

Urban challenges

LANDS SLIDE

URBUN ENERGY

SOIL EROSION
Drought Havocs
Projections of Climate Change

RCP= Representative Concentration Pathway

<table>
<thead>
<tr>
<th>Business-as-usual</th>
<th>Some mitigation</th>
<th>Strong mitigation</th>
<th>'Aggressive' mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emissions continue rising at current rates</td>
<td>Emissions rise to 2080 then fall</td>
<td>Emissions stabilize at half today's levels by 2080</td>
<td>Emissions halved by 2050</td>
</tr>
<tr>
<td>RCP 8.5*</td>
<td>RCP 6.0</td>
<td>RCP 4.5</td>
<td>RCP 2.6</td>
</tr>
<tr>
<td>As likely as not to exceed 4°C</td>
<td>Likely to exceed 2°C</td>
<td>More likely than not to exceed 2°C</td>
<td>Not likely to exceed 2°C</td>
</tr>
</tbody>
</table>
Projections of Climate Change

- Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system.
- Global surface temperature change for the end of the 21st century is likely to exceed 1.5°C relative to 1850 to 1900 for all RCP scenarios except RCP2.6.
- Arctic will be nearly ice-free by the end of the 21st century.
- Ocean will be more acidic by the end of the 21st century.
- Global mean sea level will continue to rise during the 21st century.
- There is high confidence that ENSO will remain the dominant mode of interannual variability in the tropical Pacific, with global effects in the 21st century.
- Due to the increase in moisture availability, ENSO-related precipitation variability on regional scales will likely intensify.
(a) RCP 2.6
Change in average surface temperature (1986-2005 to 2081-2100)

(b) RCP 8.5
Change in average precipitation (1986-2005 to 2081-2100)
Conclusions

• Climate change is real and its impacts have the potential to undermine and even, undo progress made in improving the socio-economic well-being of a country.

• There is need to focus on reducing the risks associated with the current climate variability and extremes in order to be able to adapt to future changes in climate.
Some Useful links:

• [www.ipcc.ch](http://www.ipcc.ch): IPCC


THANK YOU