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IPCC Report: Main Points & Analysis

The following are the main points (and their significance) of the first report of the Inter-governmental Panel on Climate Change (IPCC). The author, Meena Raman, followed the discussions in Stockholm as an observer.

By Meena Raman

At the break of dawn just past 5 am on Friday, 27 September 2013, member governments of the Intergovernmental Panel on Climate Change (IPCC) approved the 'Summary for Policymakers' of the assessment report of its Working Group I on 'Climate Change 2013: the Physical Science Basis'.

The formal approval in Stockholm, Sweden of the 'Summary for Policymakers' (SPM) at the 36th session of the IPCC was preceded by the 12th session of Working Group I (WG1). The WG1 meeting, which began on Monday, 23 September to consider the report, was to have ended on Thursday, 26 September.

However, it spilled over till the following day when agreement was finally reached past 4.30 am, and was greeted with wide applause and relief by delegates who were exhausted from working round the clock almost two nights in a row.

The meeting was attended by member governments of the IPCC, scientists who authored the report and observers.

The SPM presents a stark and dire warning about climate change science, stressing that "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."

It also states that "limiting climate change will require substantial and sustained reductions of greenhouse gas emissions."

It further warns that "cumulative emissions of carbon dioxide (CO₂) largely determine global mean surface warming by the late 21st century and beyond. Most aspects of climate change will persist for many centuries even if emissions of CO₂ are stopped. This represents a substantial multi-century climate change commitment created by past, present and future emissions of CO₂." (See further details below.)

Among some issues which saw intense discussions included: the "pause" in the warming trend for the 15-year period from 1998 to 2012; the lack of temperature data for the pre-industrial period from 1750; the evaluation of climate models and their reliability in reproducing observations; the emission reduction cuts required by 2050 relative to 1990 level; and the carbon budget remaining in relation to temperature limits.

The SPM was adopted after it was commented on extensively by governments, which proposed several amendments to the draft.

The report integrates and condenses a vast body of scientific literature from an underlying report on the physical science basis of climate change, which took six years to produce. The underlying report will be released on 30 September by the IPCC.

WG1 on the 'physical science basis' is one of three Working Groups contributing to the 5th Assessment Report of the IPCC (AR5). WGII assesses 'impacts, adaptation and vulnerability', while WGIII assesses 'options for mitigating climate change'. The latter two WG reports will be released next year.

The rigorous scrutiny by governments of the SPM was expected, given the AR5's significance for on-going negotiations for a new agreement under the Durban Platform in the United Nations Framework Convention on Climate Change (UNFCCC).

The draft SPM report of WG1 was closely examined by member governments on a line-by-line basis, which saw long and sometimes intense exchanges among governments themselves and with its authors. Several difficult issues had to be resolved through contact groups or informal small groups, which at times took many long hours to reach consensus.

Among the governments who often intervened are Brazil, China, Saudi Arabia, Fiji, St. Lucia, Kenya, Mali, Venezuela, India, the United States, Germany, Switzerland, Austria, Canada, Japan, the Netherlands and the European Union. These interventions led to many changes to the draft document.

The WG1 meeting in Stockholm was co-chaired by Qin Dahe (China) and Thomas Stocker (Switzerland), who are Co-Chairs of WG1.

The SPM is 36 pages long and contains four main sections: 'Observed changes in the climate system'; 'Drivers of climate change'; 'Understanding the climate system and its recent changes'; and 'Future global and regional climate change'.

Among the main headline statements of the SPM are:

- 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).
 - Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90% of the energy accumulated between 1971 and 2010 (high confidence). It is virtually certain that the upper ocean (0-700 m) warmed from 1971 to 2010, and it likely warmed between the 1870s and 1971.
 - Over the last two decades, the Greenland and Antarctic ice sheets have been losing mass, glaciers have continued to shrink almost worldwide, and Arctic sea ice and Northern Hemisphere spring snow cover have continued to decrease in extent (high confidence).
 - The rate of sea level rise since the mid-19th century has been larger than the mean rate during the previous two millennia (high confidence). Over the period 1901-2010, global mean sea level rose by 0.19 [0.17 to 0.21] m.
 - The atmospheric concentrations of carbon dioxide (CO₂), methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. CO₂ concentrations have increased by 40% since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions. The ocean has absorbed about 30% of the emitted anthropogenic carbon dioxide, causing ocean acidification.
 - Total radiative forcing is positive, and has led to an uptake of energy by the climate system. The largest contribution to total radiative forcing is caused by the increase in the atmospheric concentration of CO₂ since 1750. ('Radiative forcing' is the difference of radiant energy received by the earth and energy radiated back to
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space).

- Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes. This evidence for human influence has grown since AR4 (the 4th IPCC Assessment Report). It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century.
- 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 degrees C relative to 1850 to 1900 for all RCP scenarios except RCP2.6. It is likely to exceed 2 degrees C for RCP6.0 and RCP8.5, and more likely than not to exceed 2 degrees C for RCP4.5.

[RCPs (Representative Concentration Pathways) are four greenhouse gas concentration (not emissions) trajectories adopted by the IPCC for the AR5. They describe four possible climate futures, all of which are considered possible depending on how much greenhouse gases are emitted in the years to come. The four RCPs are RCP2.6, RCP4.5, RCP6, and RCP8.5, and named after a possible range of radiative forcing values in the year 2100.]

- Changes in the global water cycle in response to the warming over the 21st century will not be uniform. The contrast in precipitation between wet and dry regions and between wet and dry seasons will increase, although there may be regional exceptions.
 - The global ocean will continue to warm during the 21st century. Heat will penetrate from the surface to the deep ocean and affect ocean circulation.
 - It is very likely that the Arctic sea ice cover will continue to shrink and thin and that Northern Hemisphere spring snow cover will decrease during the 21st century as global mean surface temperature rises. Global glacier volume will further decrease.
 - Global mean sea level will continue to rise during the 21st century. Under all RCP scenarios, the rate of sea level rise will very likely exceed that observed during 1971-2010 due to increased ocean warming and increased loss of mass from glaciers and ice sheets.
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- Climate change will affect carbon cycle processes in a way that will exacerbate the increase of CO₂ in the atmosphere (high confidence). Further uptake of carbon by the ocean will increase ocean acidification.

The WGII contribution on impacts, adaptation and vulnerability will be considered by the IPCC in Yokohama, Japan, on 25-29 March 2014, while the WGIII contribution on mitigation options for climate change will be considered in Berlin on 7-11 April 2014.

The AR5 will be completed with the Synthesis Report that will be considered by the IPCC in Copenhagen on 27-31 October 2014.

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