SUMMARY OF NEW IPCC FINDINGS ON CLIMATE CHANGE

Implications for Oregon and Washington

The Climate Leadership Initiative, University of Oregon

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On February 2, 2007, the UN-sponsored Intergovernmental Panel on Climate Change (IPCC) released "Climate Change 2007: The Physical Science Basis," a comprehensive review of the current state of scientific knowledge about global climate change. The first of four technical reports to be released this year as part of the panel's Fourth Assessment Report (AR4), the study reviews evidence of changes in the chemical composition of the atmosphere, evidence of warming of the climate system, understanding of the human contribution to the observed warming, and projections of changes to the global climate expected during this century. The evidence of change and confidence in the causes are far stronger than expressed in any previous report.

The Bottom Line

Perhaps the most important outcomes of the IPCC report are the declarations that the evidence is now "unequivocal" that the earth's atmosphere and oceans are warming, and that it is "very likely" (>90% likelihood) that most of the increase in global average temperatures since 1950 can be attributed to human-caused emissions of heat-trapping gases. (Note: Science does not employ the concept of "proof." Proof is a mathematical term. Science uses a "balance of evidence" approach to determine the likelihood of an event.)

About the IPCC and the Fourth Assessment Report

The World Meteorological Organization and the UN Environment Programme established the Intergovernmental Panel on Climate Change in 1988 to provide credible assessments of scientific knowledge of global climate as a backdrop for international agreements concerning climate change. The body's first report, issued in 1990, served as a foundation for the UN Framework Convention on Climate Change. Subsequent reports were published in 1995 and 2001. One of the largest scientific enterprises in history, the new Fourth Assessment Report presents the work of 1200 scientific authors and 2500 scientific expert reviewers from 130 countries. AR4 provides "a comprehensive and rigorous picture of the global present state of knowledge of climate change."

AR4 comprises the findings of four working groups. The report of Working Group I, "The Physical Science Basis," was released in early February. Working Group II's report, "Impacts, Adaptation, and Vulnerability," is scheduled for release in April. The report of Working Group III, "Mitigation of Climate Change," is expected in May. In November, a Synthesis Report combining the findings of the three Working Groups will conclude the assessment.

Key Findings of Working Group I, "The Physical Science Basis"

Greenhouse gases: Certain atmospheric gases and aerosols have the capacity to alter the energy balance of the climate system by either trapping or reflecting solar radiation.

Global concentrations of heat-trapping carbon dioxide, methane, and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years. The atmospheric concentration of carbon dioxide, the most important greenhouse gas released by human activity, now exceeds by far the natural range over the last 650,000 years.

Warming of the climate system: Increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea levels provide "unequivocal" evidence that the climate system is warming. Eleven of the last twelve years rank among the twelve warmest years in 156 years of instrumental temperature records. The average temperature of the global ocean has increased to depths exceeding 9,800 feet, and the ocean has been absorbing more than 80 percent of the heat added to the climate system. This warming causes sea water to expand, contributing to sea level rise. Changes observed at the scale of continents, regions, and ocean basins include changes in Arctic temperatures and ice cover, widespread changes in precipitation amounts, shifts in wind patterns, changes in ocean salinity, and changes in the incidence of extreme weather including droughts, heavy precipitation, heat waves, and the intensity of hurricanes.

The human contribution to warming: The AR4 concludes that "most of the observed increase in globally averaged temperature since the mid-20th century is *very likely* (>90% likelihood) due to the observed increase in anthropogenic (human-caused) greenhouse gas concentrations." Scientists consider it *likely* (>66% likelihood) that human-caused warming has been significant over every continent except Antarctica. Human-caused effects are *likely* (>66% likelihood) to have contributed to changes in wind patterns and *more likely than not* (>50% likelihood) responsible for increasing the risk of heat waves.

Projections of future climate change: AR4 assessed future climate using a broader range of climate models than previous assessments, validated with larger sets of climate observations. The models depict possible futures by employing a range of assumptions about future emissions and economic activity. For the next two decades, models project a warming of about 0.36°F per decade, continuing a documented warming trend of about the same magnitude since 1990. Middle values of global average surface warming expected during the 21st century range between 3.2°F and 7.2°F; the full range of temperature projections for the century is 2ºF to 11.5ºF. Global average sea levels are projected to rise between 7 and 23 inches, a narrower range than prior estimates. The AR4 estimates exclude some factors, including meltwater from the Greenland and Antarctic ice sheets, for which changes cannot be forecast based on current knowledge

Findings Specific to Western North America

The new IPCC findings describe patterns of warming and regional-scale phenomena with more confidence than earlier reports, including changes in wind patterns, precipitation, and some climate extremes. While the new findings do not address western North America in detail, some of the regional phenomena reported have a bearing on the West:

- Warming is expected to be greatest at high northern latitudes.

- Snow cover (and snow-water equivalency) is projected to contract.
- Snow cover is projected to melt earlier, leading to higher spring flows and lower late summer flows.
- Extreme weather such as heat waves, drought, and heavy precipitation events are expected to increase.
- Increases in total precipitation are very likely at high (northern) latitudes.
- Ocean pH is expected to decline (a phenomenon known as "acidification").

The most severe initial impacts are likely to affect the Southwest, expected to receive less rainfall and experience more warming. The snow season is expected to shorten, and total snow cover expected to shrink. Effects on the Pacific Northwest, subject to regional factors including El Niño and ocean circulation phenomena, carry higher uncertainty.

Implications for Oregon and Washington

Although the Pacific Northwest is not directly addressed in the AR4 report, a subset of the climate scenarios evaluated as part of the new assessment have been "downscaled" to Washington, Oregon, Idaho, and western Montana by the Climate Impacts Group at the University of Washington.

All the scenarios evaluated by CIG project a warmer climate for the Pacific Northwest during the 21st century. The models project a warming of 0.5ºF per decade (slightly higher than the global average warming) at least through 2050, a rate two and a half times faster than the warming observed in this region during the twentieth century.

Changes in precipitation appear less certain than changes in temperature. The majority of scenarios project slight decreases in summer precipitation and slight increases in winter precipitation, but little change in the annual mean by mid-century. Combined with the temperature changes, these projections suggest an increase in rainfall and decrease in snowfall during winter months.

Sea level rise will affect coastal Oregon and Washington, but the effects are expected to be gradual over the next several decades, and will vary due to tectonic and other vertical land motions that can accentuate, or offset, changes in sea level depending on location.

Sources

Working Group I. 2007. *Climate Change 2007: The Physical Science Basis. Summary for Policymakers* (Geneva, Switzerland: IPCC Secretariat). Available for download from www.ipcc.ch

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