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Climate Change Impact Assessments Overlook Key Factors

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Contact: David Weymiller
(970) 491-6432
DWeymiller@UR.colostate.edu

COLORADO STATE ATMOSPHERIC SCIENTIST BELIEVES NUMBER OF INFLUENCES ARE OVERLOOKED IN U.S. NATIONAL AND INTERNATIONAL CLIMATE ASSESSMENTS

FORT COLLINS--A researcher at Colorado State University believes that regional assessments of the United States and one prepared by a United Nations panel overlook factors that are critically important to the realism of models of global climate change.

Roger Pielke Sr., professor of atmospheric science, and colleagues have shown in their research that the effect of landscape and human-caused land-use changes can have a profound effect on climate variability and change. This calls into question the realism of the climate predictions used in national and international assessments because these factors have not been included in the model.

"If land-use change is as important on the climate system as our results suggest, there is a large uncertainty in the future climate, since there is no evidence that we can accurately predict the future landscape," Pielke said.

He maintains that the General Circulation Models used by regional and national U.S. efforts and the UN-sponsored Intergovernmental Panel on Climate Change only investigate a subset of the effects of greenhouse gases and aerosols. They do not, he said, incorporate other important effects-such as land-use change and the biological effect of increased carbon dioxide-on climate. As a result, the range of possible climate futures that have been predicted for the 21st century is almost certainly larger than commonly expressed.

"This does not mean that we should not worry about future changes in climate," Pielke said. "Rather, it should raise serious questions as to our ability to reliably predict such changes."

Pielke, who addresses the 11th Symposium on Global Change at 2:45 p.m. Jan. 10 during the American Meteorological Society annual meeting in Long Beach, Calif., said landscape-plants, or lack of them-influences the earth's energy budget, directly and otherwise, through a variety of effects.

For example, as carbon dioxide concentrations increase, a corresponding increase in plant coverage could increase "transpiration," which is the release of water vapor into the atmosphere as a result of plant metabolism. While this water could cool the region's atmosphere directly or through cloud formation, it also could increase the amount of a radiatively active greenhouse gas, or water vapor.

"This is an example of a complex feedback between vegetation and the atmosphere that we do not completely understand," Pielke said.

Pielke's hypothesis that landscape affects the global energy budget (such as the absorption and reflection of sunlight) also is affected by land-use change. Cutting tropical forests, increasing urban sprawl and converting forest or grasslands to agriculture can alter the amount of sunlight absorbed or reflected and the amount of water vapor released into the atmosphere by transpiration.

"Since landscape and other atmosphere-surface interactions involve complex, non-linear feedbacks, it becomes impossible to predict accurately future climate," Pielke said. "This suggests that the scientific community might be overstating the certainty in the predictive information that is currently being provided to other researchers and to policy makers."

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