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Reaching 2009 international climate change goals will require aggressive measures

BOONE—Despite an international consensus reached in 2009 to limit climate change by reducing carbon dioxide emissions, scientists say the likelihood of meeting that goal is diminishing.

The Global Carbon Project's most recent analysis by scientists from the United States, Norway, Australia, France and the United Kingdom published in the current issue of the journal *Nature Climate Change* shows that a global economy fueled with coal, oil and natural gas is putting increasing pressure on the global climate system.

“Limiting global climate change and all of its consequences is going to require aggressive actions to limit the use of the fossil fuels,” according to Gregg Marland, one of the authors of the paper in *Nature Climate Change*. Marland, a research professor with Appalachian State University's Research Institute for Environment, Energy and Economics, is part of the international team analyzing carbon dioxide emissions worldwide.

The report, “The challenge to keep global warming below 2 °C,” was written by Glen P. Peters and Robbie M. Andrew, Center for International Climate and Environmental Research, Norway; Tom Boden, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory; Josep G. Canadell and Michael R. Raupach, Global Carbon Project, CSIRO Marine and Atmospheric Research, Australia; Philippe Ciais, Global Carbon Project, CSIRO Marine and Atmospheric Research, France; Corinne Le Quéré and Charlie Wilson, Tyndall Centre for Climate Change Research, University of East Anglia, United Kingdom; and Marland,

During the 2009 United Nations Climate Change Conference held in Copenhagen, Denmark, the world's nations agreed to try to limit climate change to a 2 degrees Celsius increase in global average surface temperature. This would require limiting the amount of carbon dioxide (the most important man-made greenhouse gas) put into the atmosphere from burning coal, oil and natural gas and clearing forests.

However, comparison of the amount of carbon dioxide put into the atmosphere by humans in recent years with many scenarios of future emissions, including the limits required to hold climate change below 2 degrees Celsius (3.6 degrees Fahrenheit), shows that there is not yet any tendency to approach the desired targets.

Growth in carbon dioxide emissions was slowed briefly around 2009 by the global financial crisis, but growth in the global economy since then has been accompanied by growth in carbon dioxide emissions.

“Fossil fuels play a very central role in global economic development but raise serious implications for the Earth's climate,” Marland said. “With a growing global population and consumption-oriented economic growth it is hard to be optimistic about the changing global climate system.”

According to the GCP study, carbon dioxide emissions rose 3 percent in 2011 to 9.5 billion metric tons of carbon and are expected to increase a further 2.6 percent by the end of 2012. From 2000 to 2011, emissions have grown at an average of 3.1 percent per year. If this emission growth continues, the global mean temperature is likely to increase by more than 5 degrees Celsius in 2100.

Global carbon dioxide emissions continue to track the high end of a range of emission scenarios, expanding the gap between current emission trends and the emission pathway required to keep the global-average temperature increase below 2 degrees Celsius.

It is now likely that in the longer term there will be a need to rely on technologies that remove carbon dioxide from the atmosphere, such as carbon capture and storage connected to bioenergy, if the temperature increase is to be limited to 2 degrees Celsius, according to the GCP report.

“We are effectively relying on technologies that are yet to be developed and this leads to persistent uncertainties on how much they can contribute to future mitigation,” said lead author of the study Glen Peters of CICERO, a climate research institute in Norway.

“The continued economic troubles in the developed world have led to reduced emissions, but this is more than compensated by strong emissions growth in fast-growing economies such as China,” he said

The GCP study shows that carbon emissions in 2011 were 54 percent above 1990 levels.

Chinese emissions grew 10 percent in 2011, or more than 200 million metric tons of carbon, which is as much as Germany emits in one year. China is emitting almost as much as the European Union on a per capita basis, about 36 percent higher than the global average per capita emissions.

In 1990, developing countries accounted for 35 percent of global carbon dioxide emissions, but in 2011 this was 58 percent.

“Each year of increased emissions makes a two degree target harder to achieve. The only feasible way to keep below two degrees is global reductions in emissions and this can only happen if the top emitters in the developed and developing world have deep and sustained mitigation,” Peters said.

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(NOTE: “The challenge to keep global warming below 2 °C” has been scheduled for Advance Online Publication (AOP) on Nature Climate Change’s website on December 2 at 1 p.m. EST, which is when the embargo will lift.)