Stabilizing climate change more daunting than thought

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If the world is serious about halting global warming then it will have to reduce carbon emissions over the next century by as much as 230 billion tonnes more than previously thought, according to new research from the University of Calgary.

This means that industrialized nations will have to cut back even further their use of fossil fuels, which are the main sources for carbon dioxide in the atmosphere.

“We know that we have to reduce emissions of carbon dioxide dramatically, in order to stabilize CO_2 in the atmosphere,” says Dr. Damon Matthews, a post-doctoral fellow in the University of Calgary’s Department of Geography. “The question is, by how much? And what information do we need in order to set appropriate emissions targets?”

Matthews’ research shows how much future emissions need to be reduced so as to allow for the possibility of adverse effects of climate changes on natural carbon sinks. His paper, ‘Decrease of emissions required to stabilize atmospheric CO_2 due to positive carbon cycle-climate feedbacks,’ appears in a forthcoming issue of Geophysical Research Letters, a leading journal for short communications in the field of climate science.

His research comes out on the eve of the United Nations Climate Change Conference in Montreal, Nov. 28-Dec. 9, which close to 10,000 people are expected to attend. It is the largest intergovernmental climate

conference since the Kyoto Protocol was adopted in 1997.

Matthews' research paper is one of the first to look at how carbon cycle feedback loops could affect efforts to stabilize CO_2. "It frames the scientific questions in a policy relevant way," he says. "If we want stabilization, what do we have to do?"

A carbon cycle feedback to climate works like this: increasing CO_2 emissions contribute to climate change; climate change reduces the effectiveness of naturally occurring carbon sinks, such as oceans and forests, which remove significant amounts of CO_2 from the atmosphere; weakened carbon sinks are unable to remove as much CO_2, meaning more remains in the atmosphere; atmospheric CO_2 growth and consequent climate changes are amplified.

This positive carbon cycle feedback to climate will require lower emissions to meet the same stabilization goal. "If we want to achieve stabilization at all, we need to move our economic decisions in that direction and reduce carbon emissions substantially. We'll have to reduce emissions even more to account for carbon cycle feedbacks."

Matthews says that policy discussions in North America quickly need to move beyond the question of whether or not climate change is real. "There are certain things in climate science that are very well established. One of them is that climate change is happening and that it's because of human intervention in the climate system. That's not a subject for debate anymore."

What is up for discussion are questions such as, How much will climate change over the next century? Is there a "safe" amount of climate change? How much do we need to limit emissions so as to avoid dangerous climate impacts?

The Intergovernmental Panel on Climate Change has predicted an average global rise in temperature of 1.4°C to 5.8°C between 1990 and 2100. Some current estimates indicate that even if successfully and completely implemented, the Kyoto Protocol will reduce that increase by somewhere between only 0.02°C and 0.28°C by the year 2050.

“Kyoto was never intended to be the final say on emissions control. This is a first step, and clearly much more is needed,” Matthews says. Kyoto requires industrialized countries to reduce emissions to (on average) 5.5% below 1990 levels by 2012. According to Matthews’ research, a comparable reduction in emissions will be required simply to keep pace with changes in the carbon cycle, with much lower emissions required to actually reduce future climate changes.

Source: University of Calgary