CO_2 emissions booming, shifting east, researchers report

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Despite widespread concern about climate change, annual carbon dioxide emissions from burning fossil fuels and manufacturing cement have grown 38 percent since 1992, from 6.1 billion tons of carbon to 8.5 billion tons in 2007.

At the same time, the source of emissions has shifted dramatically as energy use has been growing slowly in many developed countries but more quickly in some developing countries, most notably in rapidly developing Asian countries such as China and India. These are the findings of an analysis completed by the Department of Energy's Carbon Dioxide Information Analysis Center at Oak Ridge National Laboratory.

"The United States was the largest emitter of CO_2 in 1992, followed in order by China, Russia, Japan and India," said Gregg Marland of ORNL's Environmental Sciences Division. "The most recent estimates suggest that India passed Japan in 2002, China became the largest emitter in 2006, and India is poised to pass Russia to become the third largest emitter, probably this year."

The latest estimates of annual emissions of carbon dioxide to the atmosphere indicate that emissions are continuing to grow rapidly and that the pattern of emissions has changed markedly since the drafting of the United Nations Framework Convention on Climate Change in 1992. It was then that the international community expressed concern about limiting emissions of greenhouse gases.

In the Kyoto Protocol, 38 developed countries initially agreed to limit their emissions of greenhouse gases in an effort to minimize their potential impact on the Earth's climate system. At the time of drafting the United Nations Convention, those 38 countries were responsible for 62 percent of carbon dioxide emissions attributable to all countries. By the time the Kyoto Protocol was drafted in 1997 that fraction was down to 57 percent.

The recent emissions estimates show that by the time the Kyoto Protocol came into force in 2005 those 38 countries were the source of less than half of the national total of emissions (an estimated 49.7 percent), and this value as of 2007 was 47 percent. More than half of global emissions are now from the so-called "developing countries." The Kyoto Protocol has been ratified by 181 countries, but not by the United States.

Marland emphasizes that these emissions numbers are subject to some uncertainty – about 5 percent for the United States but possibly as much as 20 percent for China.

"These are our best estimates, but precise numbers cannot be known with certainty," Marland said. "Also, as countries with less certain data become more important to the overall CO2 picture, the estimates of the global total of emissions become less certain."

While this national distribution of emissions is significant in the context of international agreements like the Kyoto Protocol, its practical significance is less clear in a world linked by international commerce, co-author Jay Gregg of the University of Maryland noted. A recent study has estimated, for example, that a third of CO2 emissions from China in 2005 were due to production of goods for export. Current estimates of national CO2 emissions show simply the amount of CO2 emitted from within a country and do not take into consideration the impact of international trade in goods and services or the energy used in

international travel and transport.

The new estimates of CO2 emissions are based on energy data through 2005 from the United Nations, cement data through 2005 from the U.S. Geological Survey, energy data for 2006 and 2007 from BP, and extrapolations by Marland, Gregg and co-authors Tom Boden and Bob Andres of ORNL.

Burning fossil fuels and manufacturing cement – along with deforestation -- are the most important human-related sources of carbon dioxide emissions to the atmosphere, according to the researchers. The cement data take into account the breakdown of limestone to produce lime. Researchers also note that the new CO2 data include minor downward revisions of estimates for recent years, but the trends are not changed.

Source: Oak Ridge National Laboratory