

Rise in atmospheric CO₂ accelerates as economy grows, natural carbon sinks weaken

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Human activities are releasing carbon dioxide faster than ever, while the natural processes that normally slow its build up in the atmosphere appear to be weakening. These conclusions are drawn in a new study in the early online edition of the *Proceedings of the National Academy of Sciences*, October 22-26. The report states that “together, these effects characterize a carbon cycle that is generating stronger-than-expected climate forcing sooner than expected.”

Between 2000 to 2006, human activities such as burning fossil fuels, manufacturing cement, and tropical deforestation contributed an average of 4.1 billion metric tons of carbon to the atmosphere each year, yielding an annual growth rate for atmospheric carbon dioxide of 1.93 parts per million (ppm).

“This is the highest since the beginning of continuous monitoring in 1959,” states the report. The growth rate of atmospheric carbon dioxide is significantly larger than those for the 1980s and 1990s, which were 1.58 and 1.49 ppm per year, respectively. The present atmospheric concentration of carbon dioxide is 381 ppm, the largest concentration in the last 650,000 years, and probably in the last 20 million years.

While the worldwide acceleration in carbon dioxide emissions had been previously noted, the current analysis provides insights into its causes. “The new twist here is the demonstration that weakening land and ocean sinks are contributing to the accelerating growth of atmospheric CO₂,” says co-author Chris Field, director of the Carnegie Institution’s

Department of Global Ecology.

Changes in wind patterns over the Southern Ocean resulting from human-induced global warming have brought carbon-rich water toward the surface, reducing the ocean's ability to absorb excess carbon dioxide from the atmosphere. On land, where plant growth is the major mechanism for drawing carbon dioxide out of the atmosphere, large droughts have reduced the uptake of carbon.

Emissions from the burning of fossil fuels constituted the largest source of anthropogenic carbon, releasing an average of 7.6 billion metric tons each year between 2000 and 2006, a significant jump from 6.5 billion tons in the 1990s. Emissions generated by land-use changes such as deforestation have remained constant, but shifted in geographic focus.

Source: Carnegie Institution

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