

China's terrestrial ecosystems have absorbed 28 to 37% of its fossil fuel emissions during the 1980s and 1990s

This study found that terrestrial ecosystems in China are a net sink of 0.19–0.26 PgC yr⁻¹ during the 1980s and 1990s (1 Pg C = 10¹⁵ g C). This accumulation of carbon in Chinese ecosystems is comparable to that observed in geographic Europe but smaller than that in the conterminous United States. This carbon sink is mainly located over southern China. This region experienced regional climate change favorable to plant growth (i.e. wetter conditions) and well as large-scale reforestation and afforestation programmes since 1980s. Shrubland, an important biome in China, also appears to have accumulated carbon, as inferred by increased satellite greenness. However, this shrubland carbon sink is highly uncertain. Finally, recent trends in agricultural practice, such as a decreased export of crop residues after harvest, and an expansion of reduced and zero tillage, are also estimated to contribute carbon sequestration.

Shilong Piao from the Peking University in China brought together a team of researchers from China, France and the UK to quantify and understand the carbon balance of Chinese ecosystems from 1981 to 2000. Three independent data-streams were used. First, a large set of ecological field sites measurements, extensive forest biomass and soil carbon surveys was combined with satellite vegetation greenness index. Second, the results from this land-based carbon accounting method were verified by atmospheric inversions that rely on measurements of CO₂ concentration, models of CO₂ dispersion by atmospheric winds and first-guess information about land-atmosphere fluxes. Third, five different ecosystem models integrated from wall-to-wall across the Chinese territory are used to estimate separately the potential contribution of rising CO₂ concentrations and climate change to regional carbon balance.

The results of Piao and co-workers indicate that about 28 to 37% of China's CO₂ emissions from burning fossil fuels from 1981 to 2000 were offset by carbon accumulation in terrestrial ecosystems. This percentage of emission sequestered is comparable to the United States (20-40%) but larger than in Europe (12%). Despite the fact that carbon sequestration induced by afforestation and vegetation restoration will be persist in the near future, the percentage of fossil fuel CO₂ emissions offset by terrestrial ecosystems has declined since 2000 and may do so in the future, because of the dramatic acceleration in emissions driven by economic growth. How the tradeoff between these two factors evolves will be of great international concern as well as a big challenge for China to take actions to manage its carbon balance in the future.