Humans have a profound effect on the global carbon cycle by using large amounts of the Earth’s resources. This takes place within several different sectors, including forestry, agriculture and fossil fuel extraction and consumption. Humans also have an impact on less intensively managed ecosystems such as peatlands, wetlands and permafrost. Although a great deal of knowledge and data are contained individually within these sectors, new research highlights the need to find common areas of comparison to enable cross-sectoral regional and global carbon budgets to be produced, to help develop future carbon policy.

A knowledge of sectoral carbon budgets can make resource management options clearer to managers, stakeholders and policy makers. It enables them to see opportunities for mitigation and the consequences of management decisions. Although the researchers found some similarities in the ways in which carbon accounting takes place between different sectors, such as records of stocks, flows, processes and turnover rates, they also found significant differences between the sectors. These include:

- Goods and services provided – these are commercially valued in the case of forest and agricultural products, but not in the case of wildlife, biodiversity, amenity, watershed protection etc.
- Ecologies and life cycles – forestry lifecycles are much longer than those of annual crops, for example
- Management practices – some sectors are more intensive, others less so
- Land management policies and responsibilities – sectors have varying sets of accepted practice
- Data types and availability – these differ considerably from sector to sector
- Drivers of change - some are common across these sectors, such as climate change, whereas others are sector specific including drought and political instability

The tools available to calculate sectoral carbon budgets include eddy covariance networks (a system used to measure carbon exchange e.g. between the atmosphere and plants), carbon inventories in plants, measuring changes in carbon in soil, models, databases, remote sensing and international data sets1.

The researchers comment that liberalisation of the energy market in several OECD countries and likely shifts in regional fuel consumption as a result of the Kyoto Protocol add uncertainty to forecasts of future carbon contributions from the energy sector.

They also point out significant gaps in sector data including the lack of forest inventories and data on agriculture, grazing and grassland in developing countries, and poor understanding of the ecology of tropical forests and peatland. Melting of permafrost may be giving rise to significant losses of stored carbon, but the role this plays at a global level is as yet poorly understood. Data quality is also poor on the use of fossil fuels in developing countries.

Future research priorities for improving sector carbon budgets include better coverage in data poor regions, use of shared protocols and networks such as CarboEurope, Chinaflux/Asiaflux and SOMNET, harmonisation of common methods and protocols across sectors to facilitate comparability, and a move to full carbon and GHG accounting to avoid duplication and to assess the impact of these sectors on global warming.

1. Held by the International Energy Agency, Paris, and the Carbon Dioxide Information and Analysis Centre (CDIAC), Oak Ridge National Laboratory, CA, USA, based on UN data and holding national and regional estimates back to the year 1750


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