Regional Carbon Budgets: from methodologies to quantification

Beijing, China
15-18 November 2004

Workshop Scope

Background

There exist multiple efforts to develop approaches for national, regional, and sectoral carbon budgets. They constitute fundamental tools assisting reporting obligations and policy development under the broad mandate of the United Nationals Framework Convention for Climate Change (UNFCCC). However, the use of these budgets as bottom-up constraints for estimating carbon sources and sinks, and their comparability is limited because elements and assumptions made differ substantially among budgets. Some terrestrial budgets include land-use change and fossil fuel emissions, while others focus only on natural ecosystems, ignoring direct human activities; some are based primarily on primary data (such as forest inventory) while others depend on process-scale model simulations. The underlaying socio-economic drivers of important carbon fluxes are rarely coupled to regional carbon budgets.

The aim of this workshop is to develop a common framework to improve comparability among different approaches and estimates of carbon stocks and fluxes based on their scope and system boundaries (constraints, time-space scales, etc.). Methods for integrating observational data for both stocks and stock changes (eg, inventory data, atmospheric gradient analyses) and fluxes (eg, flux tower networks) will be incorporated. Many regional and national carbon budgets, such as the country submissions to UNFCCC, are based on country statistics without explicit reference to geo-referenced data. However, geo-referenced data for land use and land cover, climate, ecosystem structure, site history and disturbances are needed to fully integrate direct observations to the new model approaches that constrain patterns and variability of carbon sources and sinks, and to facilitate the verification requirements of international conventions. Spatial and temporal explicit approaches are key prerequisite for science-based carbon management of the coupled carbon-climate-human system. Carbon management also depends on our capability to learn from the past, so both hindcasting (retrospective forecasting) and forecasting (future projections) regional C budgets and carbon-climate-human interactions are considered.

The harmonisation of existing approaches to national and regional carbon budgets will allow to:

- compare regional budgets and their components in order to gain insights on global patterns and variability of carbon fluxes and stocks,
- use regional carbon balance estimates to constrain global estimates (multiple constrain approaches with bottom-up and top-down measurements),
- promote coordinated development of robust carbon budgeting systems for a number of space and time scales.
- move towards the development of a capability to manage the coupled carbon-climate-human system with comprehensive, quantitative, and multi-disciplinary approaches.

Objectives of the workshop

1. To identify key elements that should be part of a comprehensive regional C budget (with spatially explicit dynamics) in order to (i) fulfil the needs of stakeholders involved in carbon management at the national/regional scales, and (ii) improve understanding of the global carbon cycle.
    - Stocks: changes in soil stocks, litter,…
    - Fluxes: fossil fuel emissions, lateral transport (trade, erosion, riverine)
    - Time and space scales
    - System boundaries (anthropogenic versus natural, allocation of lateral flows to countries)
2. To identify models, approaches, and techniques available to do regional C budgets, including an assessment of :
    - Models and approaches

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- Data availability and uncertainty
- Initial conditions
- Degree of complexity (data requirements and model structure)
- Scope to explicitly include the role of humans (management, mitigation).

3. Review of regional budget quantities as bottom-up constraints for carbon sources and sinks inferred from top-down approaches (eg, atmospheric inversed methods).
4. Discuss the suitability of existing approaches and regional budgets to quantify the effects of human and natural elements of the regional C cycle and their interactions. This includes the capability to assimilate data of and couple to models of socio-economic drivers and feedbacks in view of a comprehensive framework for regional carbon management.
5. Outline a workshops series to address regional requirements for C budgeting and carbon management.

Products

1. Synthesis paper on critical elements that any regional C budget ought to have, and common framework (including areas for data improvement).
2. Synthesis paper on regional estimates of carbon sources and sinks as bottom up constraints to the global carbon cycle (reconciliation with top-down measurements).
3. Book/special issue with a paper on each region (a synthesis chapter if more than one method is available for one region).
4. Recommendations for other workshops and research proposals to further improve dynamical carbon budgeting at the regional level.
5. Web portal on carbon budgets in the GCP website.

Venue and dates

Beijing, China
15-18 November 2004

Scientific Committee

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Sponsors

Australian Greenhouse Office, Chinese Academy of Science, EU-Concerted Action for Greenhouse Gases, Global Carbon Project, Inter-American Institute for Global Change, USDA Forest Service.
Pending: US Inter-Agency Working Group for carbon cycle.

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