

Global and Regional Carbon Budgets

Global Carbon Budget (GCB) and RECCAP

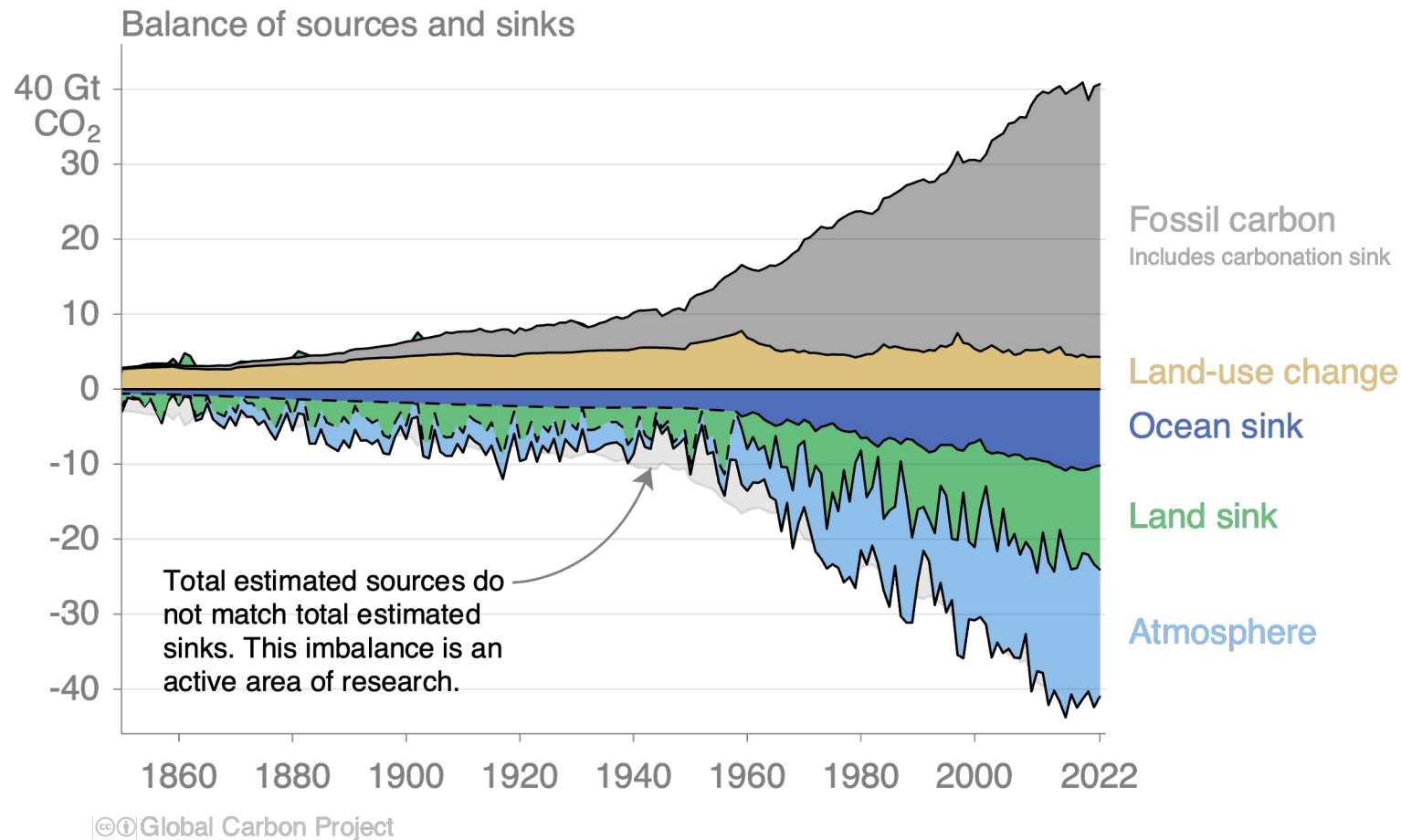
Glen Peters (CICERO) – on behalf of the Global Carbon Project

IPCC Expert Meeting on Reconciling anthropogenic land use GHG estimates

9-11 July 2024, Ispra, Italy

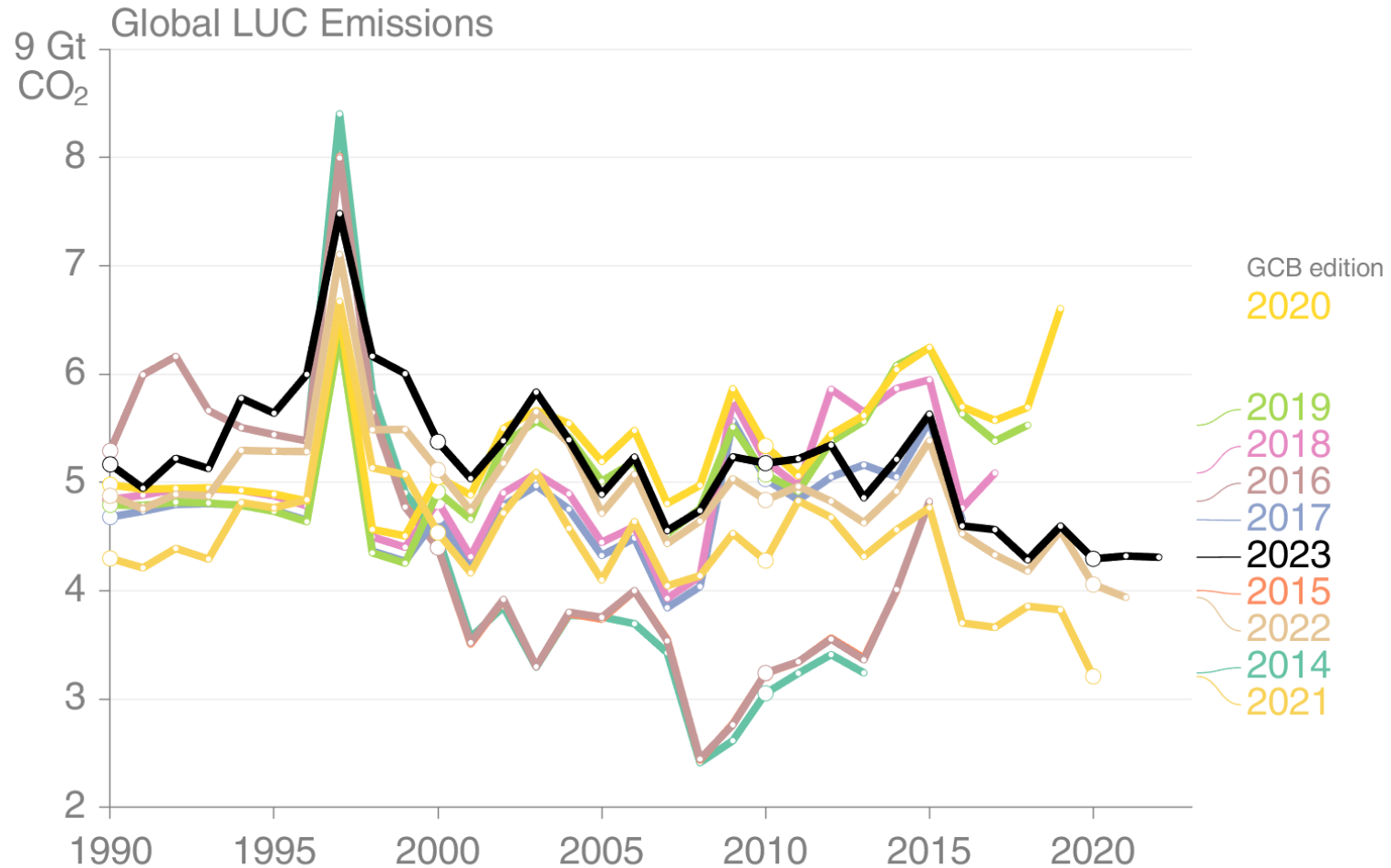
Global carbon budget: Anthropogenic perturbation of the global carbon cycle

Are we missing sources and sinks? Are we double-counting? Do different data & methods agree? What is the uncertainty?
How to attribute sinks/sources to CO₂ fertilization, climate impacts, management, wildfire emissions, etc?



Global Carbon Project – constant progress and improvement

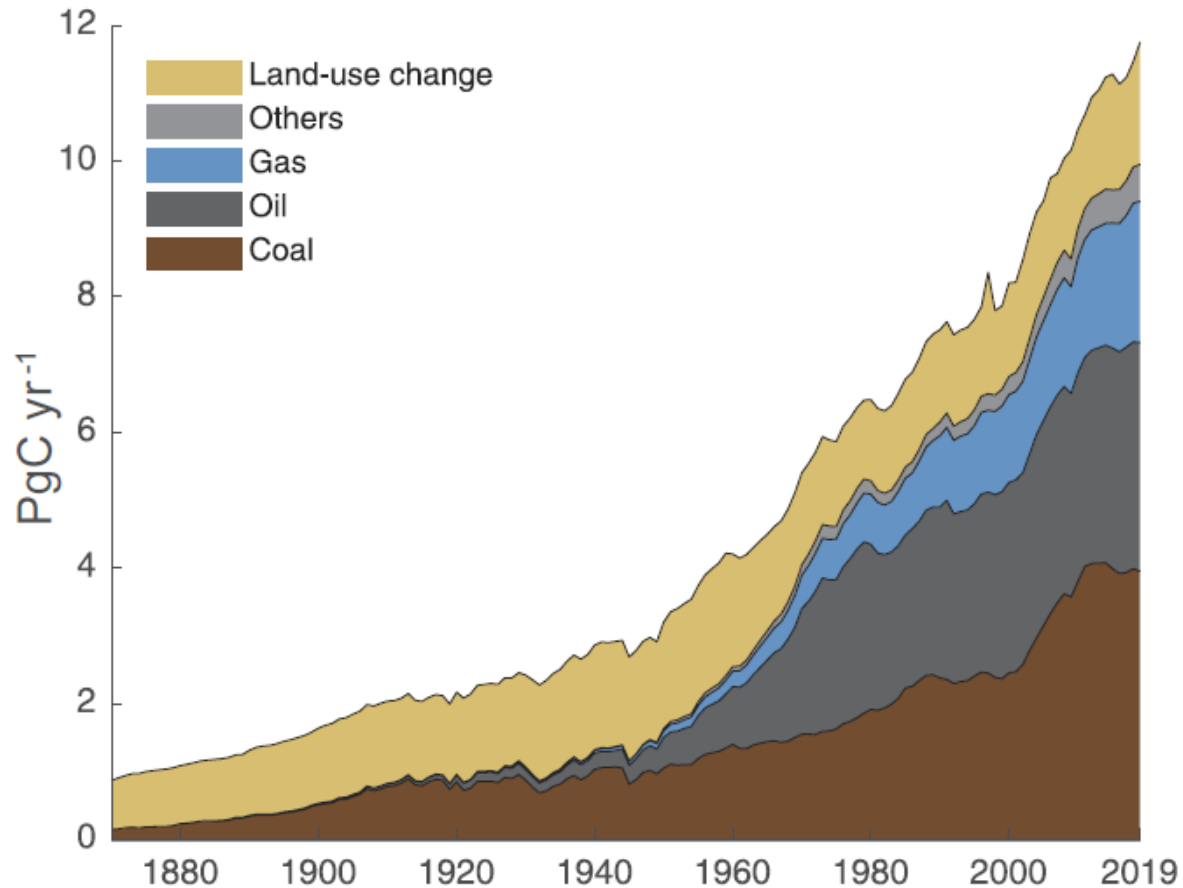
Annual updates (now in the 18th edition) ensure constant progress and improvement.
Multiple lines of evidence used (top-down, bottom-up, Earth observations), 100s of authors (collectively).



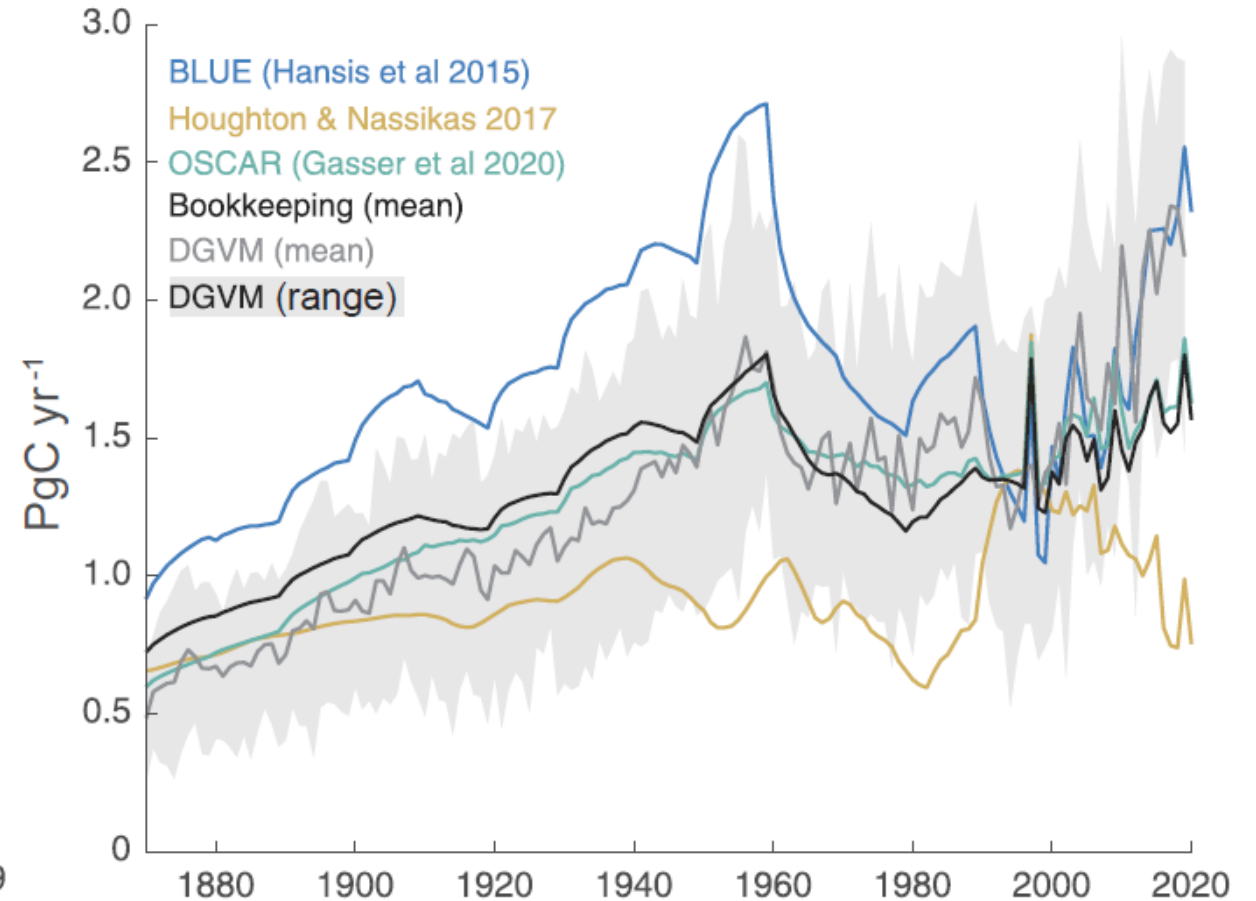
Basis for IPCC WGI, CMIP, scientific research

Annual updates bring the community together and ensure constant progress
Ready to deliver to IPCC and other scientific assessments, etc

(a) Anthropogenic global CO₂ emissions

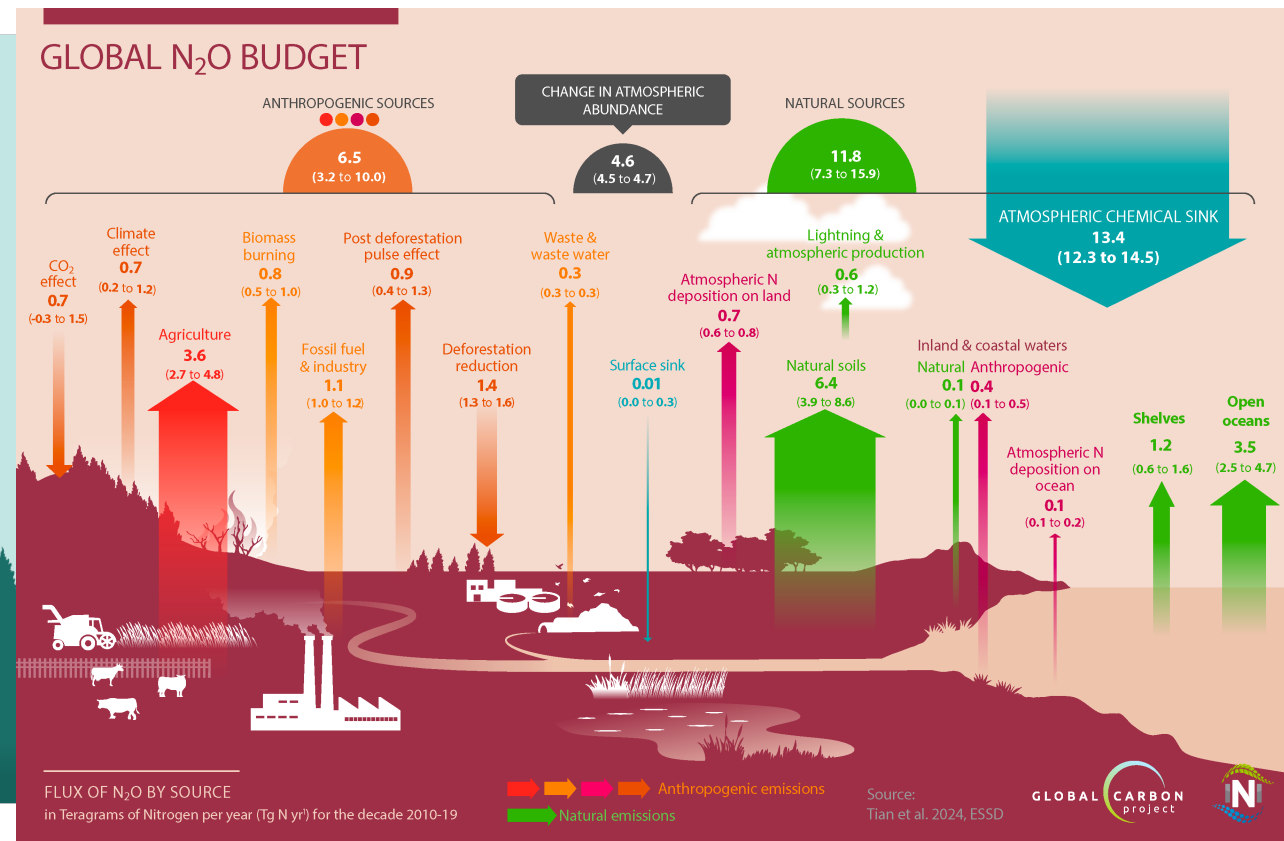
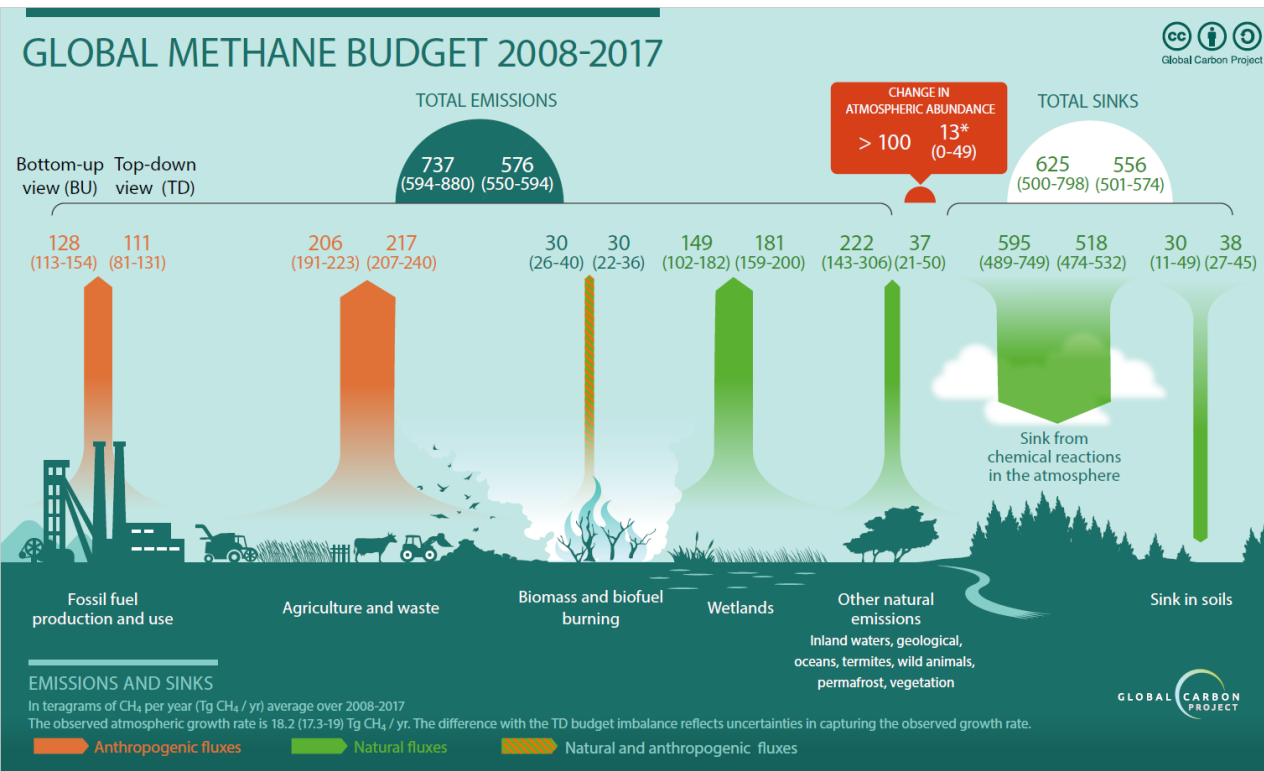


(b) Global CO₂ emissions from land-use change



Expanding to other budgets

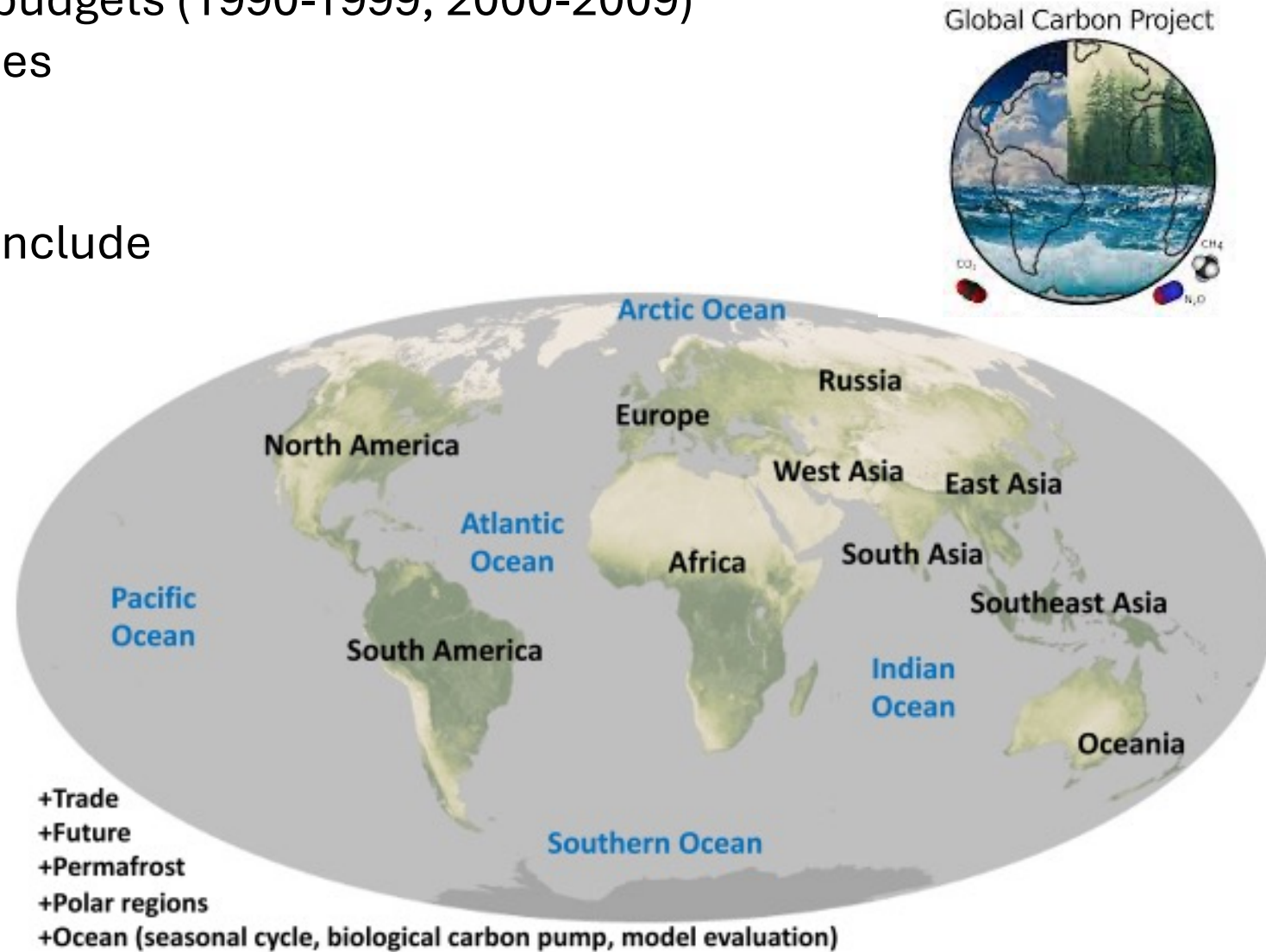
Bringing together numerous authors, multiple lines of evidence, 'closing' the budget pushes the science forward. It is natural that we now do regular methane and N₂O budgets and working on others.



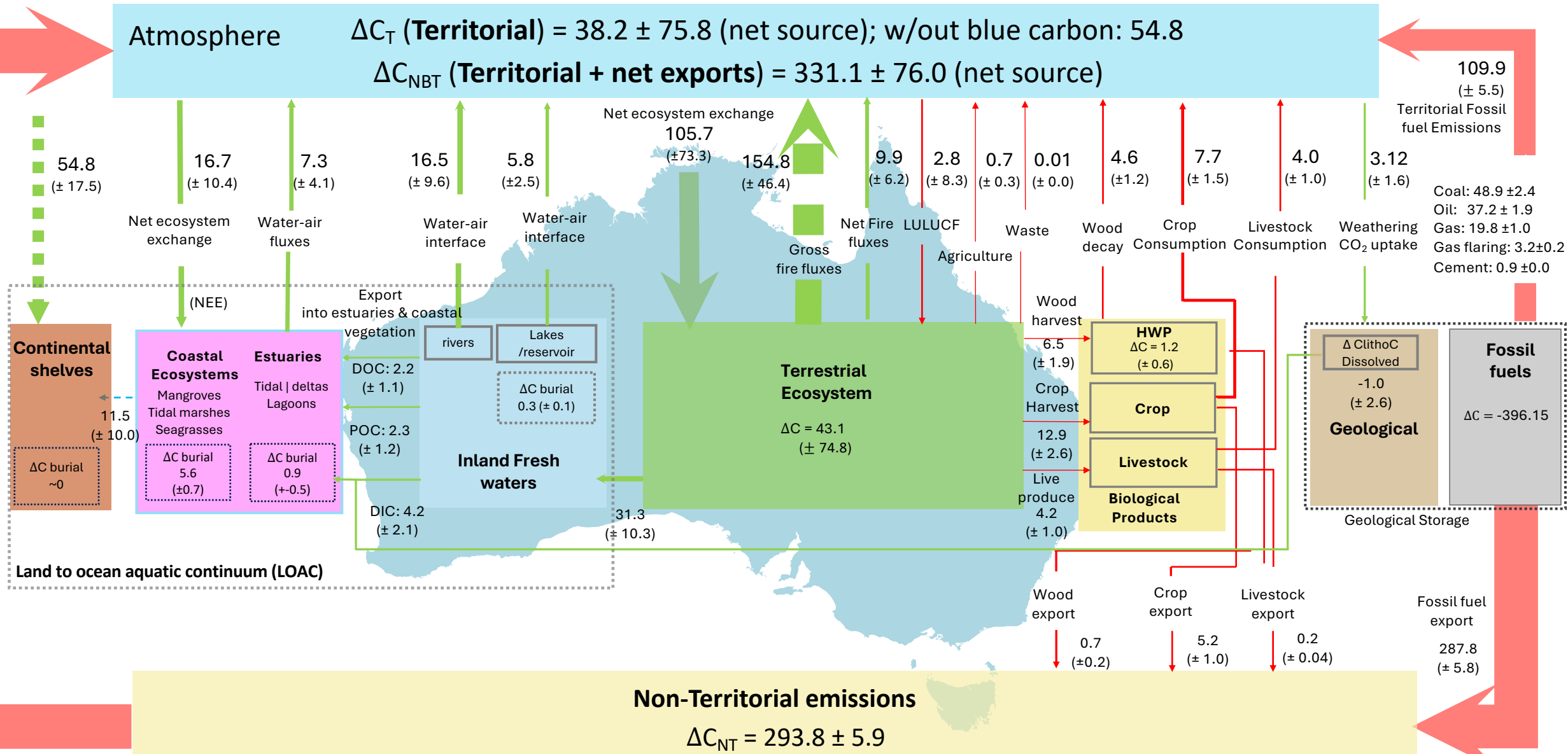
Source: Methane (2013, 2017, 2020, upcoming); N₂O budget (2020, 2024)

RECCAP – Regional Carbon Budgets

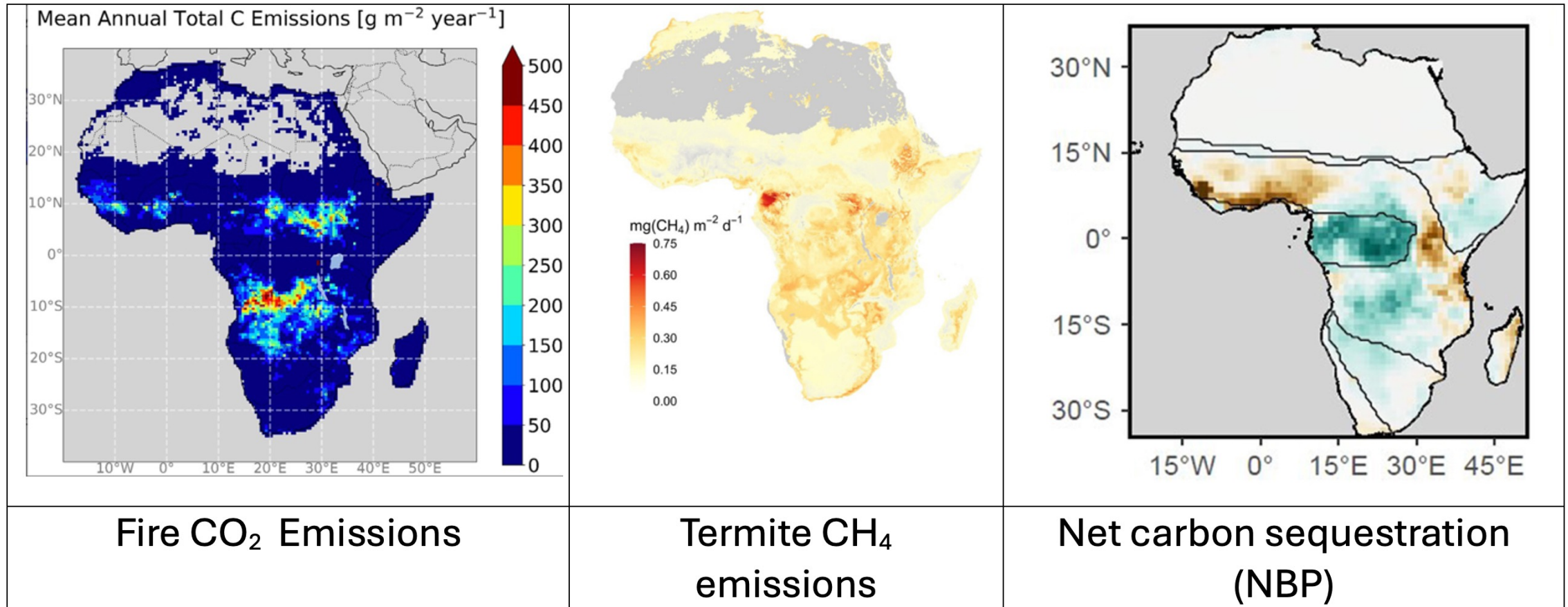
- RECCAP-1 were the first regional CO₂ budgets (1990-1999, 2000-2009)
- RECCAP-2 initiated in 2017 and includes
 - All 3 major greenhouse gases
 - Time period: 2010-2019
 - Papers in AGU Special Collection include
 - 10 land regions
 - 5 ocean basins
 - Lateral fluxes
 - inland waters
 - lateral transport,
 - estuarine/coastal
 - continental shelf
 - Special topics
 - polar regions
 - permafrost
 - future GHGs
- RECCAP-3 in planning



Australia Bottom-Up Carbon Budget, 2010-2019 (MtC-CO₂ yr⁻¹)

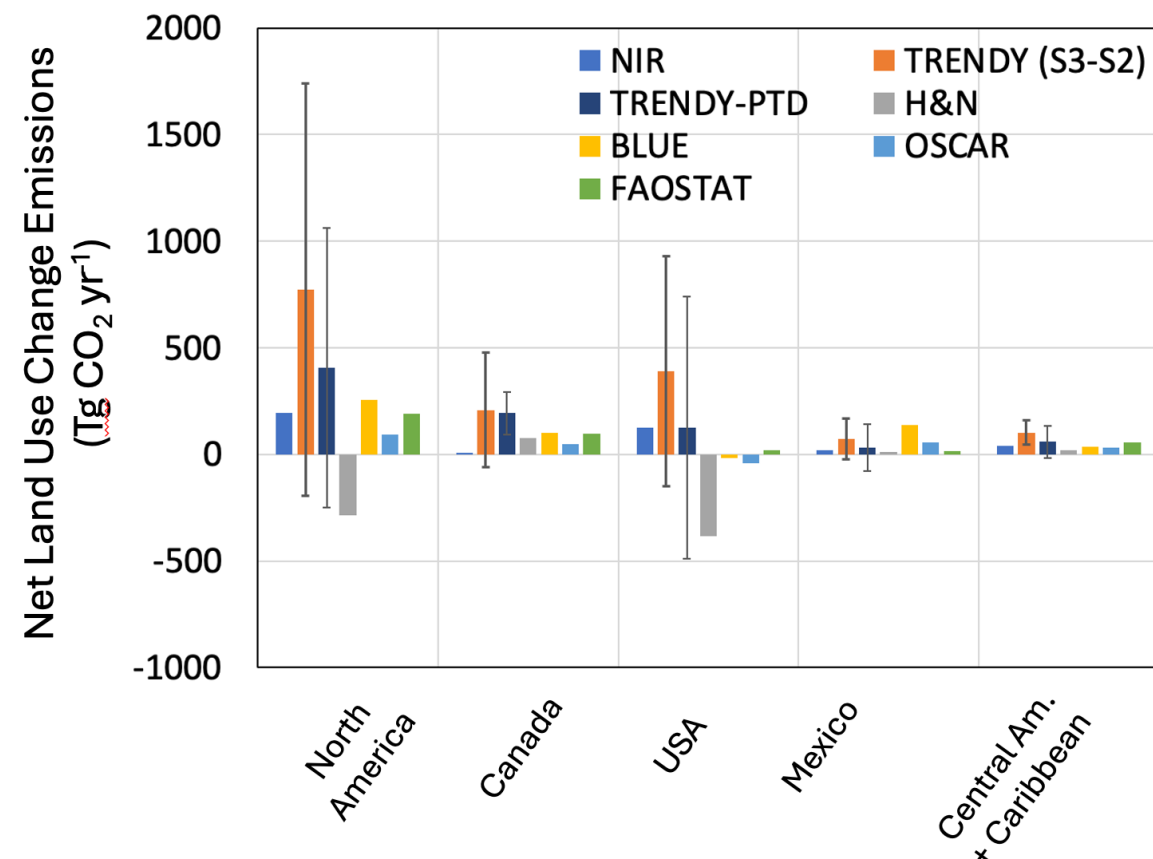


Some components of the African GHG Budget 2010-2019



RECCAP – Regional Carbon Budgets (land-use emissions)

- RECCAP2 provided more guidance to land teams (Ciais et al., 2020):
 - Compared various datasets to reconcile land-use change emissions
- Sources of data & methodologies
 - DGVM TRENDY process (global) models
 - Bookkeeping models
 - National Greenhouse Gas Inventories (IPCC)
 - FAOSTAT
- Definitions for land cover and land use
 - Gross versus net transitions
 - Wood and crop harvest
 - Export and import, and product pools
- Adjustments for reconciliation
 - Loss of additional sink capacity (LASC)



- Provide support for model development and data analyses, which will help reconcile the quantities from NGHGI, global assessments, and mitigation
- A focus on the further use Earth observation data from satellites, including atmospheric data, to improve understanding and constrain NGHGIs
- A continual move from global to comprehensive regional and national carbon budget assessments to better understand country-level unique characteristics and support national accounting
 - RECCAP-3 in early kick-off stage with support from ESA and NASA
 - Spring 2025 RECCAP-3 workshop for early-career scientists in planning stage

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Thanks to Pep Canadell and Ben Poulter

Questions?

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