

IPCC Expert Meeting on Reconciling land use emissions

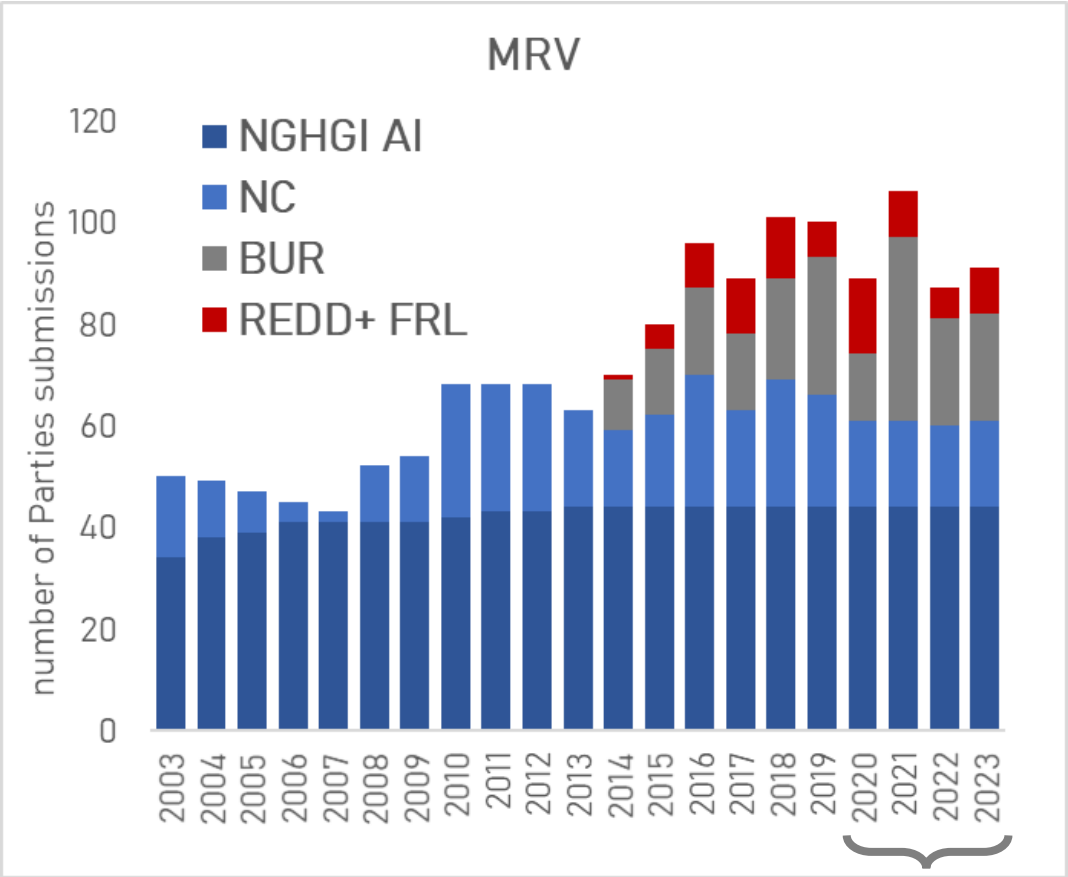
9-11th July 2024, Ispra (Italy)

Overview of current reporting in National GHG inventories

Joana Melo and Giacomo Grassi

Joint Research Centre, European Commission

Update of the JRC NGHGI database.



85% of data in the database was submitted after 2020

Table 1. Overview of the main characteristics of the sources of data used in this study.

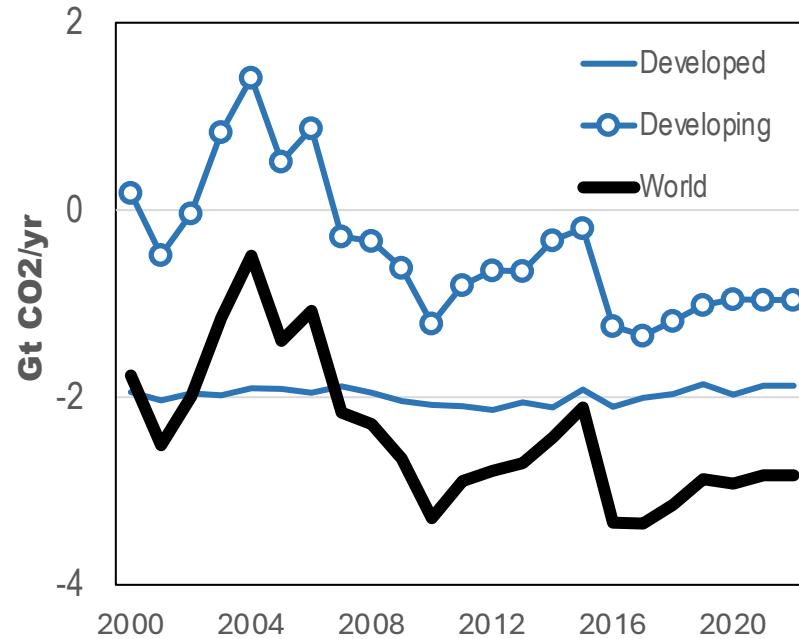
Grassi et al., 2022

| DATASET USED | | CO ₂ flux | Forest area | Latest update | Time series | Comment by the authors | |
|---|--|----------------------|--------------------------------------|---------------------|-------------------------|---|--|
| Annex I | GHGI | GHG Inventories | All land uses | Yes | 2021 | 1990–2019 | Rather complete and generally reliable |
| Source | | | n. of countries used in our database | Managed forest area | | | |
| | | | | Mha | % | | |
| Annual GHG Inventory | | | 43 | 1,603 | 46% | | |
| National Communication (NC) or Biennial Update Report (BUR) | | | 120 | 1,732 | 50% | | |
| REDD+ | | | 13 | 99 | 3% | | |
| NDC | | | 9 | 34 | 1% | | |
| No LULUCF estimate | | | 10 | 4 | 0.1% | | |
| Total | | | 195 | 3,473 | | | |
| NDC | Nationally determined contributions (NDCs) https://www4.unfccc.int/sites/NDCStaging/Pages/All.aspx | Mostly FL and DEF. | Yes, FRA 2020 used to gap fill | Mostly 2021 | from country to country | The quantity and quality of information varies considerably among countries; typically, much less information is provided than NC/BUR or REDD+, and the methodological basis is not always clear. Not assessed by UNFCCC experts, but when nothing better was available, it is used here because it is a highly relevant information under the Paris Agreement. Non-standardised tables. Numbers are taken from available tables or, in the absence of these, are approximately derived from the figures. | |

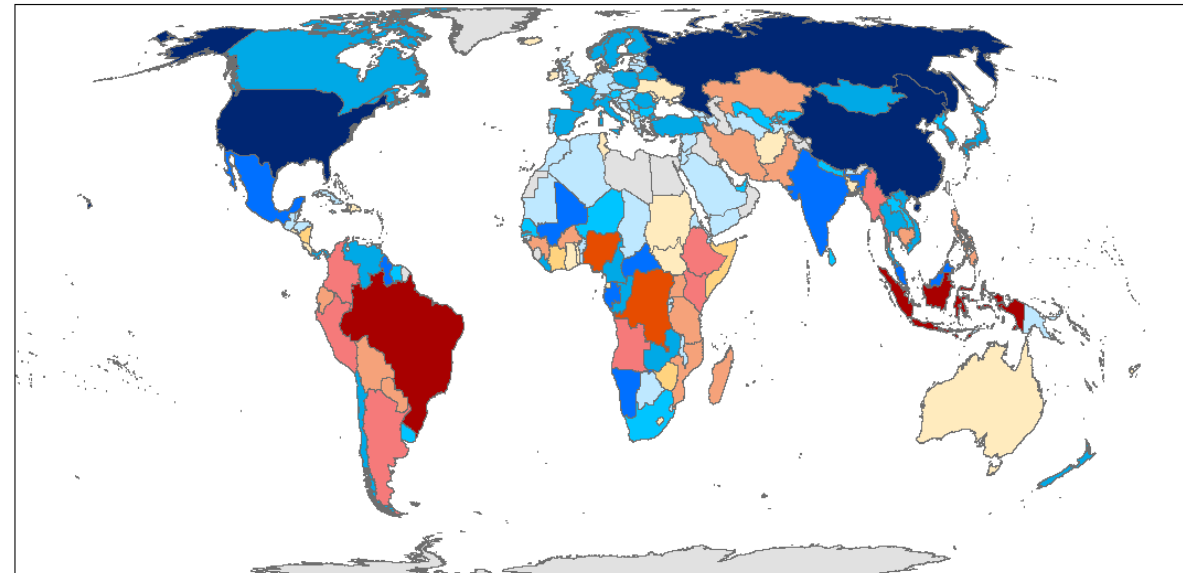
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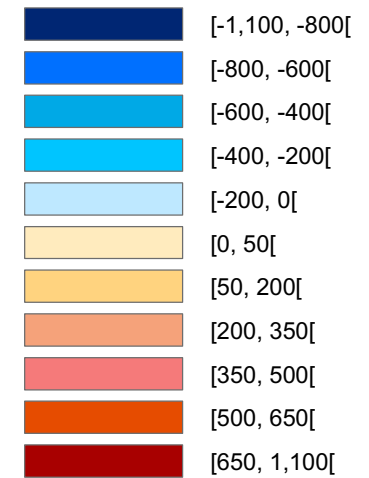
LULUCF



LULUCF



NGHGI C fluxes
2000-2022 (MtCO₂/yr)

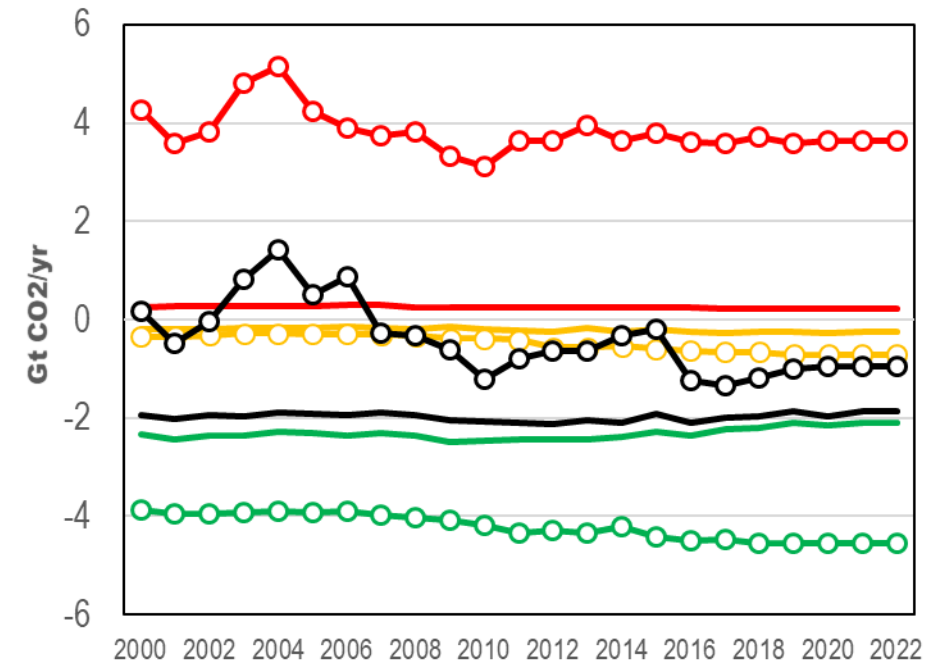
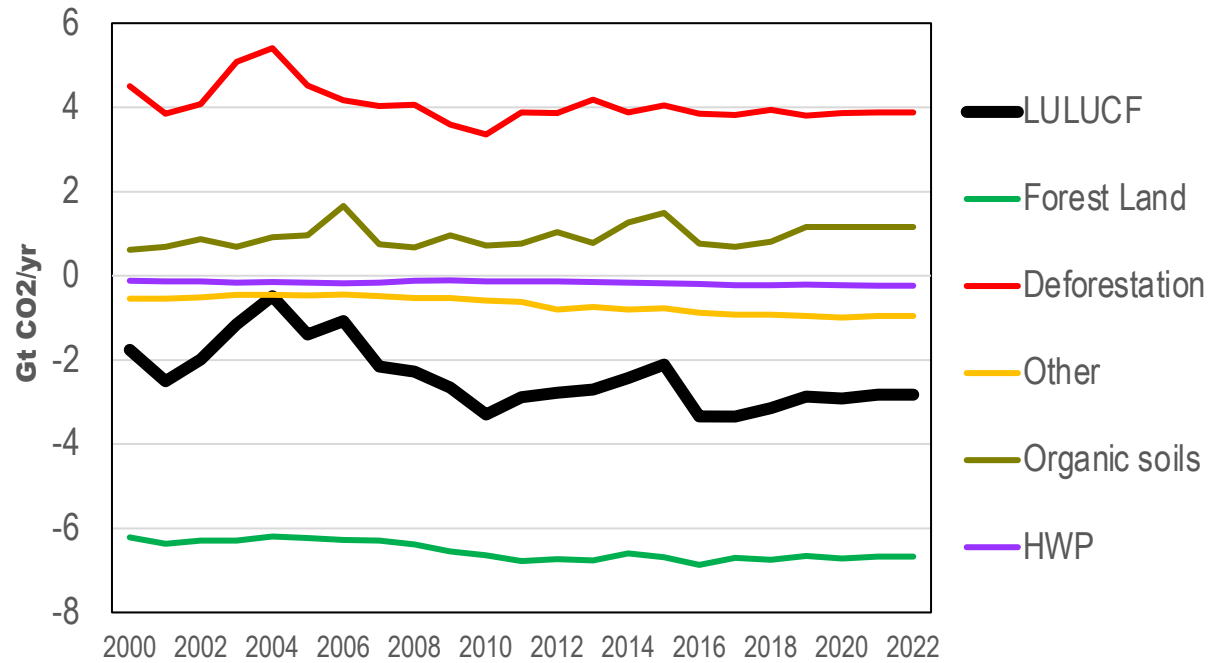


| | Developed countries (AI) | Developing countries (NAI) | Total |
|-----------|--------------------------|----------------------------|-------|
| 1991-2000 | 100% | 41% | 54% |
| 2001-2010 | 100% | 51% | 62% |
| 2011-2020 | 100% | 52% | 63% |

% of year-data available
(% of data not gap-filled)

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Developed countries (AI)

Developing countries (NAI)

Forest Land

Forest Land

Deforestation

Deforestation

Other

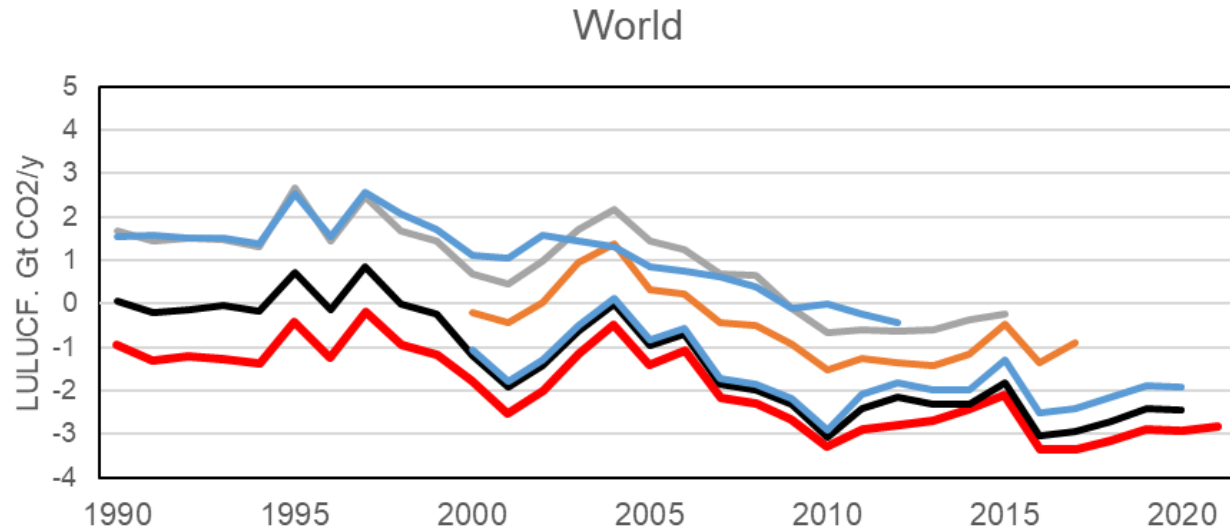
Other

LULUCF

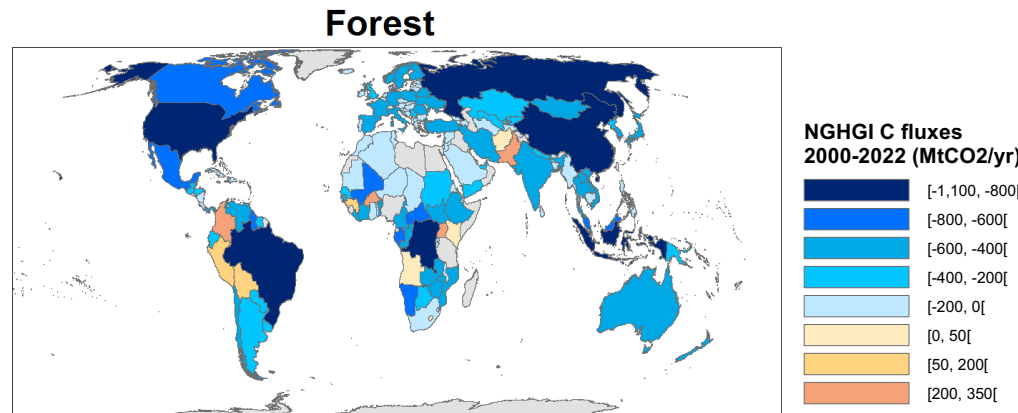
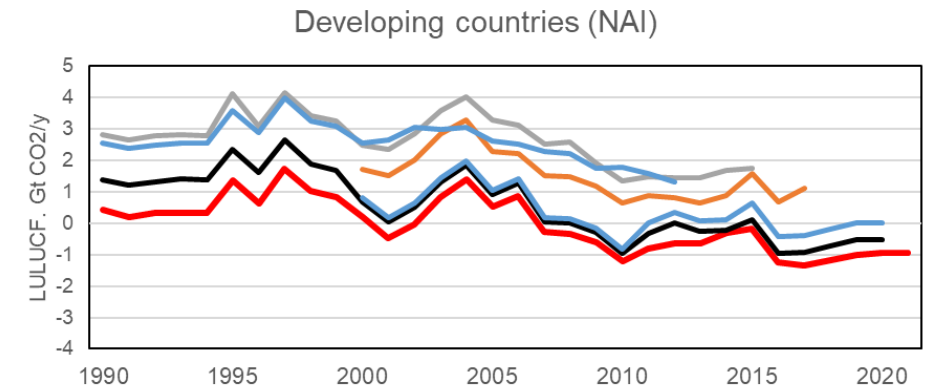
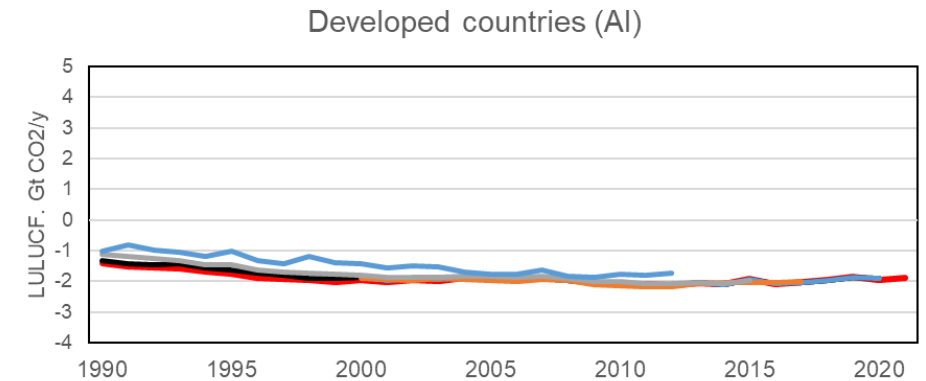
LULUCF

Update of the JRC NGHGI database.

MRV capacity and reporting of forest carbon sinks



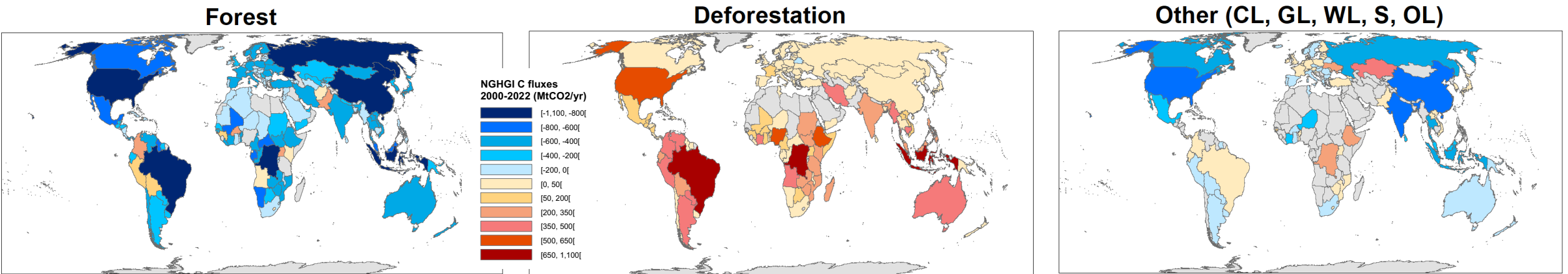
- Grassi et al. NatureCC 2017
- Grassi et al. NatureCC 2018
- Grassi et al. NatureCC 2021
- Grassi et al. ESSD 2022
- Grassi et al. ESSD 2023
- Melo et al. (in prep) 2024



Update of the JRC NGHGI database.

Statistics on categories reported (completeness and transparency)

| | total | LULUCF | Forest land | Deforestation | Other | Org. soils | HWP |
|----------------------------|-------|-----------|-------------|---------------|-----------|------------|----------|
| | | n (%) | n (%) | n (%) | n (%) | n (%) | n (%) |
| World | 195 | 185 (94%) | 180 (92%) | 127 (65%) | 87 (44%) | 37 (19%) | 59 (30%) |
| Developed countries (AI) | 43 | 43 (100%) | 42 (98%) | 41 (95%) | 43 (100%) | 33 (77%) | 40 (93%) |
| Developing countries (NAI) | 152 | 142 (93%) | 138 (90%) | 86 (56%) | 44 (29%) | 4 (3%) | 19 (12%) |



Carbon pools.

Forest land and deforestation data always include above- and below-ground biomass

Dead organic matter, and mineral soils are reported by the vast majority of Annex I countries and by the largest developing countries (NAI, including Brazil, China, India, Indonesia, Mexico).

Harvested wood products reported by 30% of countries

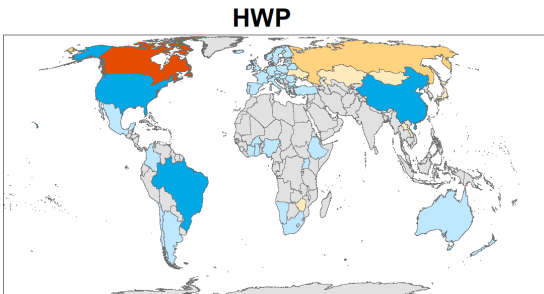


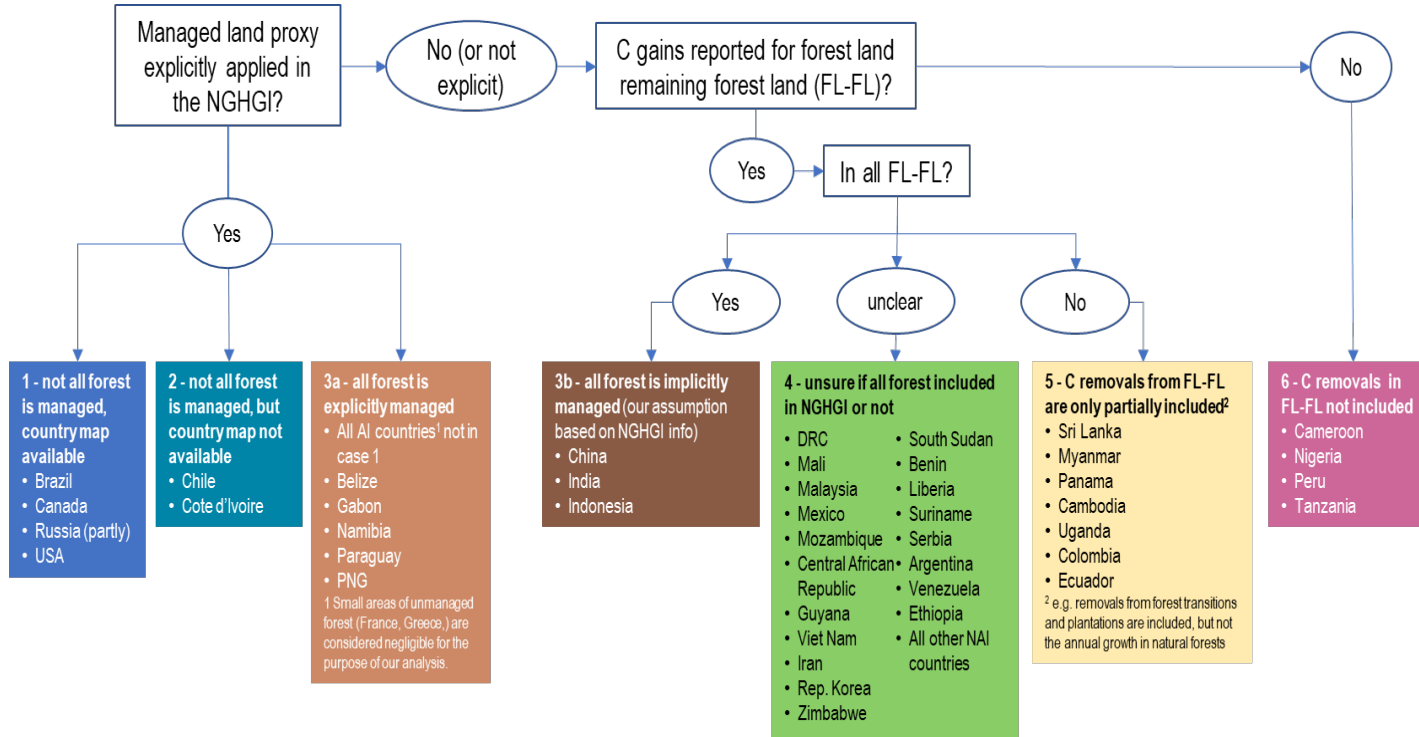
Table 5. Statistics on carbon pools (number of countries reporting, average CO₂ fluxes) for the main land use categories and sub-categories in the NGHGs of AI countries.

| C pools→ | | No. of countries reporting | | | | Average for AI countries 2000–2020 (MtCO ₂ yr ^{−1}) | | | |
|-------------------|-----------------------------------|----------------------------|---------------------|--------------|--------------|--|---------------------|--------------|--------------|
| Land use category | Land use sub-category | Living biomass | Dead organic matter | Soil mineral | Soil organic | Living biomass | Dead organic matter | Soil mineral | Soil organic |
| Forest land | Forest land remaining forest land | 42 | 31 | 20 | 19 | −1833 | −217 | −163 | 26 |
| | Land converted to forest land | 40 | 35 | 36 | 15 | −168 | −50 | −3 | 2 |
| Cropland | Cropland remaining Cropland | 38 | 4 | 35 | 28 | −6 | 2 | 1 | 121 |
| | Land converted to Cropland | 38 | 19 | 38 | 17 | 43 | 7 | 34 | 10 |
| Grassland | Grassland remaining Grassland | 22 | 9 | 25 | 26 | −2 | 1 | −5 | 97 |
| | Land converted to Grassland | 37 | 31 | 37 | 19 | 62 | −11 | −163 | 25 |

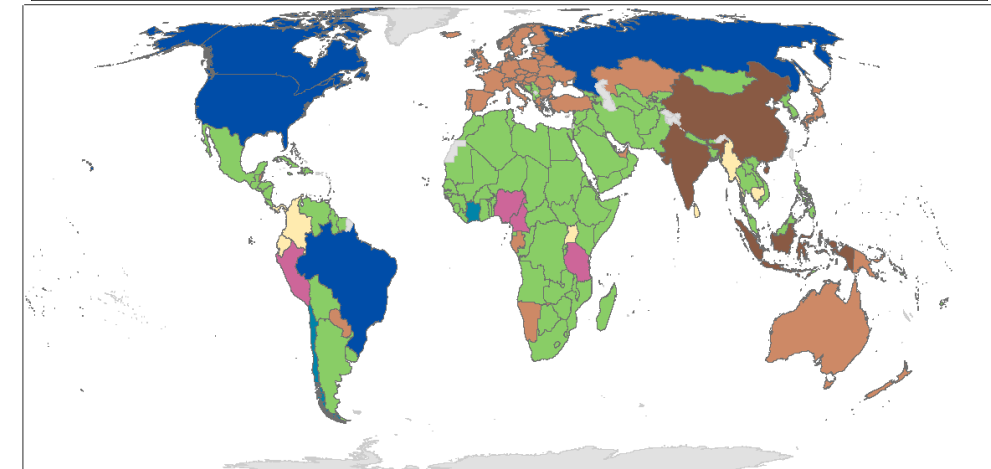
Grassi et al., 2022

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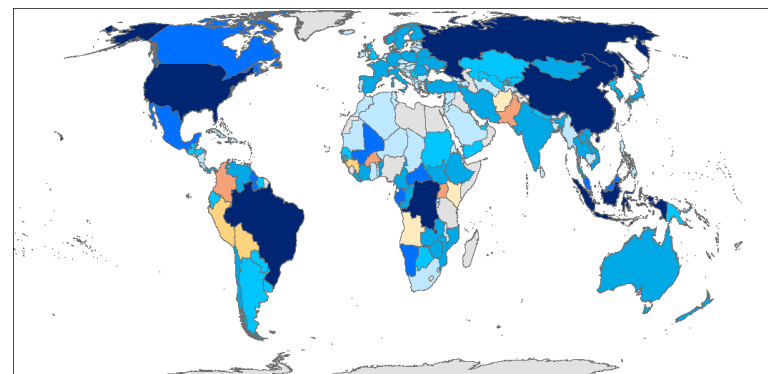
Clarity on the use of the Managed land proxy.



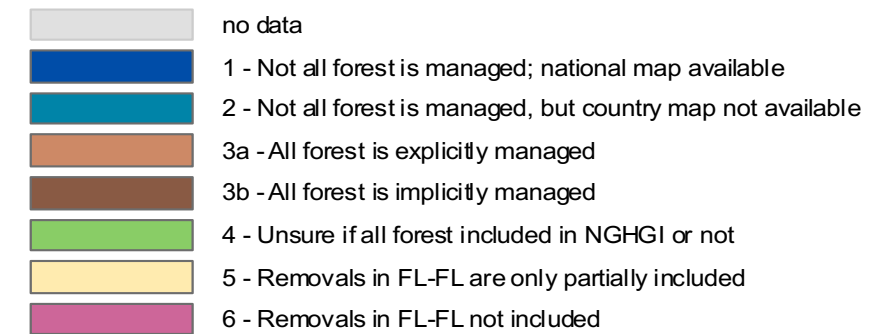
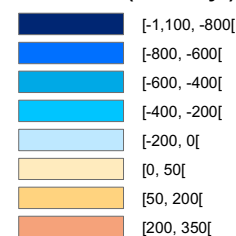
Grouping of countries based on the information on Managed Forest found in the NGHGI



Forest



NGHGI C fluxes
2000-2022 (MtCO₂/yr)



Overview of current reporting in National GHG inventories

Looking forward to better information with the ETF.

...and to greater confidence in the estimates of CO₂ fluxes from the land use sector.

IPCC Expert Meeting on Reconciling anthropogenic land use emissions (LULUCF) Greenhouse Gas Inventory
9-11 July 2024 - European Commission, Joint Research Centre - Ispra Italy
Gotoire T¹, Muchawona A¹, Zhalata W², Ngarize S³
1. Forestry Commission Zimbabwe
2. Climate Change Management Department, Ministry of Environment Zimbabwe
3. Independent International Climate and Forestry expert, Zimbabwe

LULUCF Sector Overview
Overall, the (LULUCF) sector remained a net sink from 1990 until 2009 and became a net source from 2010-2017 at 9020.59 Gg CO₂-equivalents and 1337.32 Gg CO₂-equivalents respectively. The key drivers for this decrease are increased rates of deforestation on the indigenous forests, harvesting of timber in the plantation forests and infrastructure development including creation of dams for hydropower and irrigation (Figure 1).

Figure 1: Net CO₂ emissions and removals (Gg CO₂-equivalents per year) from the LULUCF sector – time series 1990-2017

Methods
• Wall to wall mapping generated land cover maps for 1992 and 2017 which were the main source of activity data. The maps were converted to land use data using IPCC land use categories. The IPCC Approach 2 (total land-use area, including changes between categories) for the area was classified as managed.
• The land cover maps were validated using a collection of over 500 field data. The overall agreement of the maps reached more than 85%.
• Due to a lack of more land use data between 1992 and 2017, the total change in land converted to other land use types was equally distributed across the years between 1992 and 2017 to estimate the annual change in land use.
• For all land categories the IPCC (2006) Tier 1 methods and default parameters were used to estimate emissions and removals. For land remaining forest land, annual change in biomass stocks in forests, accounted for i) biomass growth, ii) net emissions due to wood removals and fuel wood use, and iii) net emissions due to disturbances (e.g. forest fires). For land converted to forest land, a 20 year transition period was assumed (IPCC, 2006), accounting for carbon changes in dead organic matter and soil in this assessment. Net CO₂ emissions and sinks from conversion of land to non-forest land use types, accounted for changes in biomass, dead organic matter and soil organic carbon.

Results
Forest land is responsible for most of the CO₂ removals in the sector and is declining sink across the time series. Grassland and Cropland had the largest net emissions at 10983.44 Gg CO₂-e per year and 783.28 Gg CO₂-e per year respectively. Net emissions from Wetlands were at 164.18 Gg CO₂-e while emissions from Settlements and other land were 224.72 Gg CO₂-e per year and 147.62 Gg CO₂-e per year (see figure 2, below).

Figure 2: Net CO₂ emissions and removals (Gg CO₂-equivalents per year) from the LULUCF sector by land-use category (forest land, cropland, grassland, wetlands, settlements and other land from 1990 to 2017)

Challenges related to emissions/removals
There remains huge challenges on collection of disaggregated activity data for all IPCC land uses and for carbon pools, for all IPCC land uses including related emission factors. There is need to build capacity in data collection and to embrace sample-based approach (Collect earth) to assess the over averaging posed by using two maps over a long period of time.

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Atsushi Sato
SRI (Research and Consulting, Co., Ltd.
SRI (Inventory compiler)

India's National GHG Inventory
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9-11 July 2024 - European Commission, Joint Research Centre - Ispra Italy
Cantinho, R., Araújo, R.V.
1 Sustainable Development Center (CDS), University of Brasília (UnB)
2 General Coordination of Climate Science (CGCL), Ministry of Science, Technology, and Innovation (MCTI)

National Inventories (NGHI) Methodology

Activity data
• 1994, 2002, 2005 (only for the Amazon biome), 2010 and 2016 land use maps produced using remote sensing images (Landsat, 30m)
• Managed Forest (within a protected area)
• Unmanaged Forest
• Secondary Forest
• Selective Logging (for the Amazon biome only)
• Reforestation (by species)
• Managed Grassland (within a protected area)
• Unmanaged Grassland
• Pasture (natural, planted under good conditions, planted under poor conditions) – for soil factors)
• Agriculture (annual or perennial in 2010, conventional or no-tillage - for soil factors)
• Settlements
• Wetlands
• Artificial Reservoirs
• Rock
• Sand Dunes
• Exposed Soil
• Mining
• Unobserved Areas (clouds and/or shadows in satellite imagery)

Forest definition
Forests are characterized by the density of trees, reducing the amount of light that reaches the soil, which limits the development of herbaceous plants and shrubs (IGBE, 2012), same used in FRA for FAO – based on the official vegetation map.

Emission/Removal factors
• Map of carbon stock for the Amazon biome (LIDAR data; Ometto et al., 2023) and other biomes (literature review and field data); DOM and BGB inclusion; literature review or IPCC (2006)
• Soil carbon stock map; factors from national field data for reforestation, croplands, and pastures; others IPCC (2006)

Annualization
• Annual deforestation rates from PRODES
• 'Managed land'
• Anthropogenic

Check the posters downstairs

LAND USE CARBON FLUX HUB
ic Achard¹, Josep G. Canadell², Pierre Friedlingstein³, David Gibbs⁴, Nancy Harris⁵, Ian⁶, Glen P. Peters⁷, Julia Pongratz⁸, Melissa Rose⁹, Simone Rossi¹, Clemens Schwingshackl¹, Stephen Sitch¹, and Giacomo Grassi¹
1 European Commission, Joint Research Centre, Ispra, Italy, 2 CSIRO, Canberra, Australia, 3 University of Exeter, UK, 4 Resources Institute, Washington DC, USA, 5 CICERO, Oslo, Norway, 6 University of Munich, Germany

GLOBAL LAND USE CARBON FLUX
Carbon fluxes from land 2000-2022
EU observatory on deforestation and forest degradation