SUPPLEMENTARY INFORMATION

Mapping land-use fluxes for 2001-2020 from global models to national inventories

Giacomo Grassi¹, Clemens Schwingshackl², Thomas Gasser³, Richard A. Houghton⁴, Stephen Sitch⁵, Josep G. Canadell⁶, Alessandro Cescatti¹, Philippe Ciais⁷, Sandro Federici⁶, Pierre Friedlingstein⁹¹⁰, Werner A. Kurz¹¹, Maria J. Sanz Sanchez¹²¹³, Raúl Abad Viñas¹, Ramdane Alkama¹, Guido Ceccherini¹, Etsushi Kato¹⁴, Daniel Kennedy¹⁵, Jürgen Knauer¹⁶, Anu Korosuo¹, Matthew J. McGrath⁷, Julia Nabel¹⁷¹⁸, Benjamin Poulter¹⁹, Simone Rossi²⁰, Anthony P. Walker²¹, Wenping Yuan²², Xu Yue²³, Julia Pongratz²,¹⁷

¹ Joint Research Centre, European Commission, Ispra, Italy.
² Ludwig-Maximilians-Universität München, Munich, Germany.
³ International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria.
⁴ Woodwell Climate Research Center, Falmouth, MA, USA.
⁵ Department of Geography, College of Life and Environmental Sciences, University of Exeter, Exeter, UK.
⁶ Global Carbon Project, CSIRO Oceans and Atmosphere, Canberra, ACT, Australia.
⁷ Laboratoire des Sciences du Climat et de l'Environnement CEA, CNRS, UVSQ, 91191 Gif sur Yvette, France
⁸ Institute for Global Environmental Strategies, Hayama, Japan.
⁹ College of Engineering, Mathematics and Physical Sciences, University of Exeter, Exeter, UK.
¹⁰ Laboratoire de Météorologie Dynamique/Institut Pierre-Simon Laplace, CNRS, Ecole Normale.
¹¹ Canadian Forest Service, Natural Resources Canada, Victoria, British Columbia, Canada.
¹² Basque Centre for Climate Change (BC3), Sede Building, 1, 1st floor, Scientific Campus of the University of the Basque Country, 48940, Leioa, Spain.
¹³ Ikerbasque, Basque Science Foundation, Maria Diaz Haroko Kalea, 3, 48013, Bilbo, Spain
¹⁴ Institute of Applied Energy, Tokyo 105-0003, Japan.
¹⁵ National Center for Atmospheric Research, Boulder, CO, USA.
¹⁶ Hawkesbury Institute for the Environment, Western Sydney University, Penrith, NSW, Australia.
¹⁷ Max Planck Institute for Meteorology, 20146 Hamburg, Germany.
¹⁸ Max Planck Institute for Biogeochemistry, Jena, Germany.
¹⁹ NASA Goddard Space Flight Center, Biospheric Sciences Laboratory, Greenbelt, MD 20771, USA.
²⁰ Independent researcher: Celle Ligure, Italy
²¹ Environmental Sciences Division and Climate Change Science Institute, Oak Ridge National Laboratory, Oak Ridge, TN, 37831, USA.
²² School of Atmospheric Sciences, Sun Yat-sen University, Zhuhai, China.
²³ School of Environmental Science and Engineering, Nanjing University of Information Science & Technology (NUIST), Nanjing, 210044, China.
Correspondence to: Giacomo Grassi (giacomo.grassi@ec.europa.eu)

Acronyms:
BM: Bookkeeping models
DGVM: Dynamic Global Vegetation Models
NGHGI: National GHG inventories
Supplementary table 1. Key data on forest area and LULUCF fluxes for the 42 countries having a non-intact (managed) forest area greater than 10 Million ha in both our study and NGHGIs. The data includes the area of non-intact (managed) forest and the CO₂ fluxes (Mt CO₂ yr⁻¹, 2001-2020 average) from bookkeeping models (BMs), Dynamic Global Vegetation Models (DGVMs), and National GHG inventories (NGHGIs) for LULUCF, forest land (including harvested wood products and excluding organic soils), deforestation, and other fluxes (organic soils, cropland, grassland etc.). The countries listed represent nearly 90% of the global area of non-intact (managed) forest. BM values are averages of three models and DGVM values are averages of 17 models, consistent with the Global Carbon Budget 2021 (Friedlingstein et al. 2022). Values for NGHGIs are from Grassi et al. (2022).
Based on non-intact forest map (Potapov et al. 2017), except for Canada and Brazil, where the country maps of managed forest were used.

Based on Grassi et al. (2022), using information on the area of managed forest from country reports to UNFCCC, gap-filled with information on the area of secondary forest and plantations from country reports to FAO-FRA 2020. Gap-filling was applied to about 2% of total forest area.

A large part of the forest area reported as managed in the NGHGI (about 120 Mha of 'other native forests') is assumed to be in carbon equilibrium.
Supplementary Figure 1. Difference between intact/non-intact forest (dark/light green, left panel) and unmanaged/managed forest (dark/light green, right panel) for Canada and Brazil. The intact/non-intact map is from Potapov et al. (2017), the managed/unmanaged map is from the NGHGIIs of Canada (Canada, 2021) and Brazil (Brazil, 2020).