

Review of "FAO estimates of net forest emissions and removals, 1990–2025" (essd-2025-635) – third round

General assessment

I thank the authors for a thorough and constructive revision. The dataset is valuable and I would like to see it published. However, a few points still need fixing. It should not be difficult.

Part A follows up on my previous comments; Part B collects observations on the revised text.

Part A — Follow-up on my previous comments

Previous comments 3 and 4: USA and Italy

I appreciate that the authors have chosen to document the case of the USA. The current text states that the carry-forward "implies for specific countries a FAO underestimate of 2020–2025 mean removals, had national carbon stock kept increasing past 2022—and an overestimate in the opposite case". If possible, please indicate how many countries carried a pre-2025 value forward in FRA 2025, and document this in the relevant FAOSTAT country notes.

I am glad the authors re-examined Italy, and I agree that a correction was warranted. The way it has been handled, however, leaves the reader with no way to reconstruct what happened.

According to the reply, the correction was made by carrying the 2020 forest-land fluxes forward to 2025. This is not a procedure described in Sect. 2.2, and it contrasts with the description of the dataset at lines 235–237 as relying on "straightforward, reproducible equations, grounded in official national statistics". I note also that the reply apparently describes the correction in two different ways — changing the country input carbon stock data on the basis of the biomass DM time series, and carrying the 2020 fluxes forward — which are not the same operation. Please state which was applied.

The authors write that they "preferred not to name the country affected directly in the manuscript—although we may publish a country note in FAOSTAT detailing the above changes". This is awkward for two reasons. The manuscript (lines 278–279) already states that the corrections "were documented in the relevant FAOSTAT country notes", in the past tense, while the reply puts that publication in the future and in the conditional. And by the authors' own account the adjustment is worth 100–110 Mt CO₂ yr⁻¹ under FAO 2 and FAO 3 and propagates to the southern Europe, Europe, EU27, OECD and Annex I aggregates — the last of which carries the paper's central UNFCCC comparison (Tables 4 and 5). Several Table

4 values have changed accordingly relative to the previous version, yet nothing in the manuscript records that input data were revised, and the Zenodo DOI is unchanged. The revised deposit should be given a distinct version, with the change noted in its description, and a sentence in Sect. 2.3 should record the correction. As things stand now, a reader cannot tell which country, which years, or what magnitude is affected. Please name Italy here, as the authors already do for the USA a few lines above.

Please also state the criterion that distinguishes cases where input data are corrected (Italy) from those where they are not (USA), since the reply notes a general preference not to correct FRA data.

Previous comment 5: Forest area in Russia

The authors note that the revision of the Russian data appeared in an NGHGI submission dated 25 June 2026, well after the cut-off date of 15 March 2026.

I think the wrong cells have been used to assess the area of managed land. The value of 739 Mha that I reported previously is already contained in Russia's 2025 submission https://unfccc.int/sites/default/files/resource/RUS-CRT-2025-V1.0-20250419-003747_awaiting%20submission.zip, well before the cut-off. The relevant entry is the cell "Forest land (managed)" in Table 4.1, which corresponds to the more detailed managed and unmanaged areas reported in 4.A.

The correct value affects Tables 2 and 3, and for Russia it brings the UNFCCC figure much closer to the FAO one.

Previous comment 6: Significant figures in Tables 2 and 3

My request for one further digit was declined on the grounds that 50% uncertainty permits at most two significant figures. The manuscript no longer states 50% (see B.1 below), so that justification no longer corresponds to the text. In any case these two tables report forest areas, which are considerably better constrained than fluxes — the text itself quotes country areas to the megahectare at lines 328–331. As currently rounded, Table 3 gives Namibia's FAO area as "0.0" Gha with a difference of "+0.1 (+800%)". Please report areas in Mha.

Previous comment 7: Managed-area boundaries

This is among the most important comments of this round.

I appreciate the added emphasis that the area difference matters for the affected countries, but one qualification is still needed. The conclusion at lines 562–564 rests on a comparison of aggregate totals. For countries such as Brazil (–150 Mha), Canada (–140 Mha), China (+85 Mha), the Russian Federation (+70 Mha) and Namibia (+60 Mha) the area differences between UNFCCC and FAO are large, and the good match at global level arises because these differences run in opposite directions and cancel. The country-specific explanations at lines 353–364 are useful, but they do not support the conclusion that "flux estimates made on the entire forest land area could be considered anthropogenic in the sense of the IPCC managed land use proxy, ensuing consistency and thus comparability of FAO and UNFCCC data". The Conclusions need a sentence acknowledging that for several important countries the difference in forest area limits the comparability of FAO and UNFCCC emissions.

Previous comment 10: Table 4 arithmetic

The arithmetic check I asked for is still outstanding. Several cells do not satisfy Eq. (6) by more than rounding:

Period	Aggregate Model	NFC + FL	CSC reported
2010–2020 World	FAO 2	$3.2 - 4.7 = -1.5$	-1.9
2010–2020 NAI	FAO 3	$3.3 - 3.1 = +0.2$	+0.6
2010–2020 World	FAO 3	$4.0 - 6.6 = -2.6$	-2.9
2010–2020 World	FAO 1	$2.9 - 4.1 = -1.2$	-1.4
2010–2020 NAI	FAO 2	$3.0 - 2.4 = +0.6$	+0.8
2000–2010 World	FAO 3	$4.3 - 7.1 = -2.8$	-3.0

World = AI + NAI also fails for 2010–2020 CSC (FAO 1: $-2.1 + 0.9 = -1.2$ against -1.4 ; FAO 2: $-2.4 + 0.8 = -1.6$ against -1.9 ; FAO 3: $-3.3 + 0.6 = -2.7$ against -2.9). The 1990–2000 and 2020–2025 blocks seem consistent, so the problem looks localised. Please check again.

Previous comment 11: Extent of gap-filling in the input data

I had asked whether the interpolation and sub-regional gap-filling described in the FRA report — trends in growing stock used to fill below-ground, dead wood and litter; sub-regional average stock per hectare for non-reporting countries — carry through into the FAOSTAT estimates. The revision notes that FRA 2025 reduced the need for FAO imputations (line 90) and addresses gap-filling for the soil pool only (lines 252–254). For a data-description paper this is basic information for a user. A short statement of what share of values, by pool, derives from country reporting rather than from imputation would be a real addition, all the more so given that soil contributes a further 30–40% of removals on forest land (lines 388–390) and that FAO 3 is the model used in the GCB comparison (lines 189–190).

Part B — New observations on the revised text

B.1 Uncertainty

The revision replaces the previous 50% (95% CI) with "a range of about $\pm 30\%$ around FAO 2 values" (lines 284–285), derived from the spread of the three FAO models. As far as I can tell neither referee asked for this, and I would ask the authors to reconsider. The spread between FAO 1, 2 and 3 (defined at lines 180–183) reflects the completeness of the carbon pools included: a structural difference with a known direction, since FAO 3 is by construction the most complete. It is not a dispersion around a central value, and it cannot be read as an uncertainty range. Either keep a propagated uncertainty and present the model spread separately, as a sensitivity to pool coverage, or explain why the two can be equated.

B.2 Abstract

The abstract, rewritten in this round, reports good agreement at global, AI and NAI levels. The results state that the FAO range includes the UNFCCC value across all flux-category and aggregate combinations "except for FL fluxes for the NAI aggregate" (line 436). By my reading of Table 5 there are two exceptions rather than one: for World FL the FAO range is -3.9 to -6.7 against a UNFCCC value of -6.9 , which falls outside it. Please check.

More generally, the non-Annex I sink gap of 1.2 – 2.4 Gt CO₂ yr⁻¹ (line 439) and its attribution to countries reporting constant carbon density (lines 440–442) is among the more valuable contributions of this paper. It deserves a place in the abstract.

Minor point: the abstract quotes 2015–2025 values (lines 24–27) that do not correspond to any period in Table 4.