



Interactive comment on “The consolidated European synthesis of CO₂ emissions and removals for EU27 and UK: 1990–2018” by Ana Maria Roxana Petrescu et al.

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Dear Topical Editor Nellie Elguindi, Dear Referees and Editorial Board of ESSD,

As requested, we are submitting responses to the referees' comments. We will provide as well a track-change version of the manuscript. We will not refer here to grammar or language corrections, but they will appear in the marked-up manuscript. The lines in the following answers refer to the track-change version of the manuscript. Given that both referees for the companion paper “The consolidated European synthesis of CH₄ and N₂O emissions for EU27 and UK: 1990–2017” asked us to

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merge all data figures in one spreadsheet “data_figures_CO2.xlsx”, we did the same for this synthesis and we updated the Zenodo DOI repository with v2 found here: <https://doi.org/10.5281/zenodo.4626578>

Interactive comment on: “The consolidated European synthesis of CO2 emissions for EU27 and UK: 1990–2018” by A.M.R. Petrescu et al.

REPLY TO THE REFEREE #1 The authors thank very much Referee #1 for the very positive and thoughtful comments and for the fact that the Referee acknowledges the manuscript as being a comprehensive source of information regarding a wide range of public products, very useful for modelers and the whole scientific community and for quantifying the progresses towards mitigation target assessed through the global stocktake. Below we provide answers to the minor comments posted by Referee #1.

Response to minor comments and changes in manuscript:

Line 62: Replace “CO2 land sources/sinks” with “biogenic CO2 land sources/sinks”.

On L162 we define the two CO2 components analyzed in this study as CO2 fossil and CO2 land. After much discussion in the preparation of this manuscript, we choose to follow the general IPCC GPG, which defines “land” in footnote 4: “The IPCC Good Practice Guidance (GPG) for Land Use, Land Use Change and Forestry (IPCC 2003) describes a uniform structure for reporting emissions and removals of greenhouse gases. This format for reporting can be seen as “land based”; all land in the country must be identified as having remained in one of six classes since a previous survey, or as having changed to a different (identified) class in that period. According to IPCC SRCCL: Land covers the terrestrial portion of the biosphere that comprises the natural resources (soil, near surface air, vegetation and other biota, and water) the ecological processes, topography, and human settlements and infrastructure that operate within that system”. Some communities prefer “biogenic” to describe these fluxes, while others found this confusing as fluxes from unmanaged forests, for example, are “biogenic” but not included in inventories reported to the UNFCCC. As this comparison is central

to our work, we decided that “land” as defined by the IPCC was a good compromise. We added this explanation to footnote 4.

Line 93: “represent the sum of the effects of sources and sinks”. We made the correction.

Line 98: UK does not use atmospheric observations to complement CO₂ (due to difficulty in representing the biogenic fluxes). The referee is right, the UK uses inverse observations only for CH₄ emissions and not for CO₂. However, this introduction paragraph (L87-L99) refers in general to GHGs.

Line 166: Include description of acronyms. We added acronyms for EDGAR, FAOSTAT, BP, CDIAC, EIA and IEA. GCP is explained on L124.

Lines 169-170: Parenthesis do not match. We made the correction.

Line 177: Replace “show” with “shown”. We made the correction (now on L179).

Line 215: Isn't the term “CO₂ land fluxes” too generic since the target is LULUCF? Indeed the target is the LULUCF sector and its component classes: forest, cropland, grassland, wetlands, settlements, other land and harvest. We decided to use “land” fluxes according to the UNFCCC definition (footnote 4): “The IPCC Good Practice Guidance (GPG) for Land Use, Land Use Change and Forestry (IPCC 2003) describes a uniform structure for reporting emissions and removals of greenhouse gases. This format for reporting can be seen as “land based”; all land in the country must be identified as having remained in one of six classes since a previous survey, or as having changed to a different (identified) class in that period. According to IPCC SRCCL: Land covers the terrestrial portion of the biosphere that comprises the natural resources (soil, near surface air, vegetation and other biota, and water) the ecological processes, topography, and human settlements and infrastructure that operate within that system”.

Line 238: Replace “then” with “than”. We made the correction on L243.

Line 243: Replace “differing” with “differ”. We made the correction.

Table 2: Why is there no contact/lab for BU H&N bookkeeping model? We added the Woodwell Climate Research Center.

Lines 256-257: Numbers with and without LULUCF are not consistent with LULUCF contribution. This is because the numbers for EU27+UK with and without LULUCF are in CO₂eq and include contribution of CH₄ and N₂O as well. The number we report for LULUCF only (0.28 Gt CO₂) is only for CO₂.

Line 541: Replace “variation trend” with “variation”. We made the suggested correction the new L552.

Line 567: “The sink in ORCHIDEE is due to. . .” We included “to” on the new L579.

Line 605-606: “for instance the CO₂ fertilization effects. . .” We deleted “by” on the new L617.

Line 673: “by subtracting from the inversion estimates the emissions. . .” We deleted “of” on the new L684.

Line 718: It is not clear what are the indirect fluxes on managed land included in NGHGs. According to IPCC (2010), land fluxes can be differentiated into three processes: (1) direct anthropogenic effects (land use and land use change, e.g., harvest, other management, deforestation), (2) indirect anthropogenic effects (e.g., changes induced by human-induced climate change, including CO₂ fertilization and nitrogen deposition changes), and (3) natural effects (i.e., that would happen without human-caused climate change, such as natural disturbances). The UNFCCC NGHG inventories use the notion of managed land as a proxy for anthropogenic emissions (IPCC, 2006) and hence in practice include most or all (depending on the specific method) indirect emissions into their anthropogenic estimates (Petrescu et al., 2020b). We added on L729 the following explanation: “(indirect fluxes on managed land included in NGHGs and FAOSTAT e.g., changes due to human-induced climate change, including CO₂ fertilization and nitrogen deposition changes) (Petrescu et al., 2020b)”.

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