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Reply on RC1

Jeroen Kuenen et al.

Author comment on "CAMS-REG-v4: a state-of-the-art high-resolution European emission inventory for air quality modelling" by Jeroen Kuenen et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2021-242-AC1, 2021

The authors want to thank the reviewer for the positive feedback and constructive comments. Below we provide a point-by-point answer on each of the minor comments raised (R = comments from the reviewer, A = reply from the authors).

R: Point sources. Reading your manuscript, I understand, that the EPRTR databases includes emissions from both fuel consumption and processing. You only had to organize and classified the information (by fuel, industry type, and so on). But you have not calculated the emissions using activity data + emissions factors. Eventually any calculation was provided by IIASA-GAINS model. Is this correct?. So, the main job was to harmonize the time series and eventually correct some missing/mistaken data. If such a complete database is available, why is there important differences with your previous version of the inventory or EDGAR (Figure 10, or Figure 8, although I understand that this figure is for total emissions).

A: The reviewer is correct in the assumption that the emission calculation itself (totals by country, sector, pollutant, year) are not dependent on E-PRTR. E-PRTR (and other point source databases) are only used for spatially disaggregating the emissions. For the comparison to our earlier versions the differences are mainly caused by updated reporting (annually by national inventories and to a lesser extent also corrections in E-PRTR for historical years).

EDGAR does not use the E-PRTR database (to our knowledge) in its methodology. Point source emissions are estimated but using different databases (e.g. CARMA for power plants).

Figure 10 shows a large difference in NMVOC emissions for category B, but this is largely the share of category E which is included here (as described in the manuscript just above Fig 10). The other differences are largely from non-point sources and from countries outside the EU (where reported data are either generally of lower quality or not available).

R: Regarding the road transport. Road network are available form Openstreetmap.org . You also say that road traffic is also available for Europe from OTM. Given that information may not have the same quality for all countries and region. What kind of data quality checking have you performed on traffic volume? Have you performed some fuel-mass balances?, Car registry? Tonn/passenger km travelled?

A: Very good remark. We have made comparisons of the traffic volume (total vkms) calculated from these per road type and vehicle category with the vkms provided by the COPERT vehicle emission model. We noted in particular that at highways the total vkms were higher and in urban areas lower, pointing towards an incomplete coverage at smaller roads.

In part based on these comparisons, we have added an additional split in the emissions (which were originally provided per country and main vehicle type) between the road types (urban, rural, highway) based on data from COPERT (last bullet point in Sect. 2.2.4. The distribution maps are applied at this level, which ensures a certain consistency in the total emissions per country, vehicle type and road type. However, within those categories the split to individual roads and the traffic volume on each one of them has not been checked in detail, only visual checks have been made on the maps (e.g. are the highways with highest intensity where they are expected).

We added an additional paragraph to the SI (section on road transport) to describe this.

R: Regarding the shipping sector. Have you directly adopted the STEAM outputs, or was it processed again?. Are STEAM data public available?. Since STEAM is a Model, it has its own uncertainties and proxies to fill their own gaps. Have you performed any kind of double checking the information from this model?. Fuel checking, ports arrivals, tons and passenger movements by ports and so on?.

Outputs of STEAM can be accessed, but the model code, the activity and fleet technical data are not publicly available because contracts with third parties prohibit sharing of commercial data. There are recent comparisons of STEAM predictions and the EU fuel reporting scheme (EU MRV). One such example can be found in HELCOM Maritime21/4-2.INF (https://portal.helcom.fi/meetings/MARITIME%2021-2021-939/MeetingDocuments/4-2%20Emissions%20from%20Baltic%20Sea%20shipping%20in%202006%20-%202020.pdf) document where vessel level fuel consumption from STEAM was compared with reported totals. In short, average error for vessel level consumption was 20%, whereas the inventory total for 1604 vessels was off by 7.8%. Uncertainties may arise from multiple reasons, but largest deviations are usually observed in cases where vessel technical description is incomplete. Differences arising from different ship modeling approaches were recently reported (Schwarzkopf et al, Atmospheric Environment: X, Volume 12, December 2021, 100132) and the scatter in emission factor assignment in Grigoriadis et al., Atmospheric Environment: X, Volume 12, December 2021, 100142

R: Figure 10: caption should include the sector names for A, B., C…. (or " see Table 5")

A: We added a reference to Table 5 in the caption.