RC1: 'Comment on essd-2024-601', Anonymous Referee #1, 02 Jun 2025

The manuscript described the data source, methodology, trend analysis, and uncertainty analysis for HTAP_v3.1 emission inventory very clearly. I only have several small suggestions:

The authors are grateful to the Reviewer's suggestions which helped improving the clarity of the manuscript. In the following, answers to each comment are provided in red. Moreover, data quality checks have been performed and implemented, as well as regional aggregations have slightly changed to fully align with IPCC AR6 final regions. For all these reason, this revised version has been renamed as HTAP_v3.2 for transparency also in the manuscript, to avoid any misunderstanding with the previous release. This final product is made publicly available at 10.5281/zenodo.17086684.

Page 16, Global NOx emissions: The authors described that "increased from 108.2 Mt in 2000 to 113.6 Mt in 2018 as a result of the increase in energy- and industry-related activities for most of the world regions (in particular over the Asian domain)". However, from Figure 2, global NOx emissions increase from 2000 to around 2011, then decrease slightly. The Asian emissions also show similar trend. So, I think the description is inaccurate and may cause misunderstandings.

The text has been revised accordingly with the reviewer's suggestion, as reported here below. Moreover, the regional aggregation has been slightly revised for consistency with the IPCC AR6 definition which includes "Australia, Japan, and New Zealand" instead of "Asia-Pacific Developed" and "Eastern Europe and West-Central Asia" instead of "Eurasia". Therefore, figures and numbers presented in the text have been revised accordingly.

"Global NOx emissions increased from 108.2 Mt in 2000 to 122.1 Mt on 2011 as a result of the increase in energy- and industry-related activities in particular over the Asian domain, and then started declining down to 113.6 Mt in 2018 due to the stabilisation and reduction of Chinese emissions. A further decline of global emissions down to 103 Mt in 2020 is found as consequence of the COID-19 pandemic. On the opposite, historically industrialised countries show the strongest decreases in the emissions: -65.8% for North America (in 2018 compared to 2000), -43.6% for Europe -34.8% for Australia, Japan, and New Zealand. Lower emission reductions are found for Eastern Europe and West-Central Asia (-8.9%)."

Page 17, Particulate matter emissions: The authors only described PM10 emissions. I would also expect short descriptions of PM2.5, BC, and OC emissions.

Detailed numbers for PM2.5, BC and OC were not presented in the text since very similar to the PM10 figures. The following sentence has been added to the manuscript for completeness:

"The same regional emission trends and order of magnitude of emission changes as for PM_{10} is also found for $PM_{2.5}$, BC and OC."

Page 17, line 26: "+56.8.0% for Africa"?

The number has been corrected to "+56.8%".

Figure 3: As authors mentioned sectoral emissions changes several times in text, I would expect a figure like Figure 2 but shows the time series of sectoral emissions.

A new figure showing emission time series by sector and pollutant has been added as Fig. 3, as shown in the following:
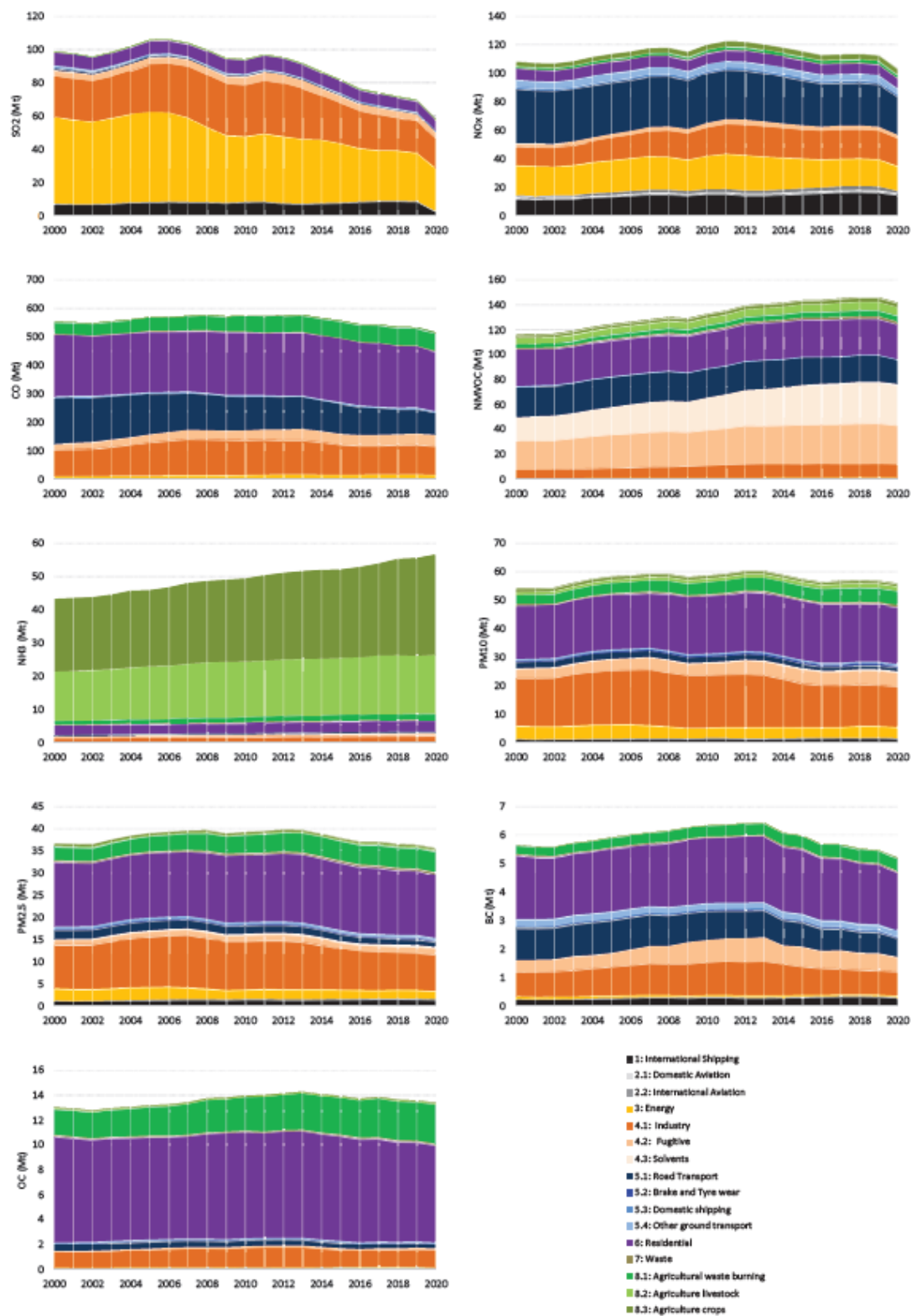
Figure 3. Time series of gaseous and particulate matter pollutants from HTAP_v3.2 by sector.

Figure 5: numbers of subplots are lost.

The numbers for the subplots of Fig 5 were added.

Page 18, line 41: Does Figure 6 show PM2.5 or PM10? Description here is inconsistent with the figure caption.

Figure 6 refers to PM2.5 emissions, therefore the text has been modified accordingly.

Page 18, line 43-45: Please add brief descriptions of these two figures as well.

Since the description of the spatial and temporal variability of PM10 and NH3 emissions from agricultural is also provided in the following section (3.3), we added to the text the link to that part to avoid content repetition.

Citations of figures in SI are wrong. Please check and correct carefully.

The citations of the supplementary figures were checked and updated, in particular at page 19.

Page 19, line 38: Is it "Figure 12 and 13"?

Yes, the text is correct since it is describing the seasonality of agriculture related emissions which are presented in Figs 12 and 13.

Page 19, line 41-44: Add China as well?

Page 19, line 46: I can't find map for March in Figure 13.

The Reviewer is correct since we display only the month of April, although a similar pattern is found for March. The text has been revised accordingly for consistency.

Page 27 in SI: "Table S2 provides the list of Global Emissions InitiAtive (GEIA) 25 NMVOC groups included in HTAP_v3.1 with the corresponding molecular formula." should be Table S3.

The table number has been corrected from S2 to S3.

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