

Comment on **essd-2021-218**

Anonymous Referee #2

Referee comment on "High-resolution spatial-distribution maps of road transport exhaust emissions in Chile, 1990–2020" by Mauricio Osses et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-218-RC2>, 2021

This manuscript presents a description of a Chilean high resolution gridded emission inventory of road transport exhaust emissions for the period 1990–2020, as well as a comparison against the emissions reported by the EDGAR inventory. As stated by the authors in the introduction section, the availability of high-resolution emission inventories in Chile that are consistent, updated and cover a long period of time is currently limited. Therefore, the dataset presented in the manuscript is of interest and a good contribution to ESSD. I recommend the manuscript to be published once the following comments have been addressed:

- Title of the manuscript: I would suggest to rephrase the title from "High-definition spatial distribution maps of (…)" to "High-resolution spatial distribution of (…)" as it is more frequently used in the scientific literature.
- Vehicle fleet composition: According to the authors, information on the vehicle fleet composition per political region is obtained from official government data. Is this source of information reporting data on registered vehicles or the actual "in-use fleet" (i.e., on-the-road or circulating fleet)? Several studies have highlighted strong discrepancies between registered and in-use vehicle fleet compositions. Official vehicle registries can suffer from certain limitations, including: i) they may include vehicles that have been scrapped (or that are registered but hardly being used) and ii) they include information regarding where the vehicles are registered but not where are actually driven. How did the authors overcome these limitations? Please provide an explanation.
- Total Fuel Consumption (TFC): Could you provide a figure (or summary table) that shows the results of the comparison between calculated TFC and reported fuel sales for each region? This would allow understanding better the discrepancies between the two datasets.
- Spatial distribution: Could you provide a reference for the toll barrier vehicle counts used for computing the average road weight factors? Could you provide a summary table with the shares regarding the distribution of vehicles into urban and interurban activity per region? Perhaps this information could be included as part of Table 3 (Annual activity level not only per region and vehicle type but also discriminated between urban and interurban).
- Emission factors: Authors use the emission factors reported by COPERT 5, which is a

vehicle emission calculator originally developed for Europe. Can the authors say something on how precise is COPERT in reflecting the Chilean fleet and driving conditions? Is there any database of measured local emission factors that could be used for comparison purposes?

- Cold-start emissions: Are cold-start emissions included in the inventory? These type of exhaust emissions could be significant in certain regions of the country during winter time. Please specify.
- Comparisons with EDGAR (1): At the beginning of section 3.2.4, authors mention that they performed a comparison between INEMA and EDGARv4.3.2. However, it looks to me that the comparison is done against EDGARv5.0, as v4.3.2 reports emissions only until 2012, and v5.0 up to 2015. Please specify and correct if needed.
- Comparisons with EDGAR (2): The discrepancies between the emission trends reported by INEMA and EDGAR are quite significant, especially for NO_x. In my opinion, it would be good to include in the comparison other state-of-the-art global emission inventories such as CEDS (<http://www.globalchange.umd.edu/ceds/>) or ECLIPSEv6b (<https://iiasa.ac.at/web/home/research/researchPrograms/air/ECLIPSEv6b.html>), in order to see if their trends match better with the one reported by INEMA. Moreover, both CEDS and ECLIPSE report emissions up to more recent years (e.g., 2019).
- Comparisons with EDGAR (3): Regarding the discrepancy between the NO_x emission trends reported by INEMA and EDGAR, and considering that road transport is the main contributor to total NO_x emissions, perhaps it would be interesting to contrast these results against the evolution of NO₂ concentrations in traffic stations for the same period of time (i.e., 1990 to 2015). These would allow seeing if NO₂ concentrations show a positive or negative trend (or if concentrations remain unchanged) and subsequently if they correlate better with the trend reported by INEMA or EDGAR.
- Comparisons with EDGAR (4): The EDGARv5.0 emission inventory includes estimates of PM emissions from road surface wear and road vehicle tyre and break wear based on the EMEP/EEA guidebook 2019 Tier 1 approach. If I understood correctly, these sources of non-exhaust emissions are not considered in INEMA and could explain some of the discrepancies shown between the two datasets for PM. Please comment on that.
- Comparisons with EDGAR (5): Figures 7, 8, 9 and 10: Please include the whole time series of the INEMA emissions (up to 2020)
- Effect of COVID-19 restrictions: the time series presented by the authors include the year 2020, which was heavily affected by COVID-19 restrictions. I think it would be very relevant to include a section discussing the results for 2020 and quantifying how they compare to the previous year (2019) (i.e., how total emissions decreased as a consequence of COVID-19). This comment is also linked to the previous one about representing the whole 1990-2020 trend in figures 7 to 10.
- Conclusions: I would recommend to the authors to re-structure the conclusions section and add a new subsection entitled "Limitations of the dataset", in which they clearly state what are the limitations of the current inventory (e.g., non-inclusion of cold-start emissions, use of EU emission factors instead of local EF, ...).
- Others (1): Replace MP2.5 for PM2.5 in the text
- Others (2): The reference (Gomez, 2020) is missing
- Figure 5: For clarification, I would suggest to change the units to e.g., kg/year. Also, it would be interesting to see the spatial distribution not only of the emissions in specific urban regions but across the whole country.
- Figure 6: Please add a legend