

Comment on **essd-2022-162**

Anonymous Referee #1

Referee comment on "Spatially resolved hourly traffic emission over megacity Delhi using advanced traffic flow data" by Akash Biswal et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-162-RC1>, 2022

This manuscript describes a high-resolution road traffic emission inventory developed for the megacity of Delhi using advanced and detailed traffic data and speed based EFs. The strength of the estimation methodology presented in the paper is in its usage of very detailed and advanced input datasets, which allows obtaining high-resolution spatio-temporal emission maps and disaggregate the emission results according to several categories, including vehicle types, road classes or hours of the day. The resulting dataset is therefore relevant for policy makers, but also for air quality who wants to use it as input in the chemical transport models. The paper is well written and structured, and its quality is very good, which makes it a good contribution to ESSD. However, there are some aspects related to the methodology proposed that should be better clarified before the manuscript is accepted for publication.

- Hourly congestion data from TomTom is used to estimate traffic flow information per road link following equation 3, which is presented in section 2.1.1. According to this equation, if congestion is 0, the resulting traffic flow will also be 0. Nevertheless, null congestion does not imply having no cars circulating. Can you clarify how this issue is corrected in the model?
- The resulting traffic flow information is validated by comparing estimated and reported annual VKT information. However, results from this comparison are not provided. Please add them. Also, could you provide a comparison between estimated and measured hourly traffic flow for those locations in which you have observations? This will give to the reader a better feeling of how robust this approach is.
- According to the authors, "the emissions are further adjusted with a factor of 1.2 to account for real-time driving behaviour (frequent braking, acceleration, deceleration) as per the study by Lejri et al., (2018)". This assumption seems to me a bit arbitrary a not well justified. Is this factor applied to all hours of the day (including those when congestion is low)? Is this factor applied equally to all pollutants? Why?
- As mentioned by the authors, emissions are estimated using COPERT 5, which is a European emission model and has not been calibrated for Indian conditions. Can the authors elaborate a bit more on the potential uncertainty for key vehicle categories such as two-wheeler motor bikes? Perhaps the EFs reported by COPERT could be

compared against results reported by local studies such as Adak et al., 2016, <https://doi.org/10.1016/j.scitotenv.2015.11.099>.

- The vehicular classification is done making use of shares provided by different local sources of information. Are these shares based on information of registered vehicles or actual circulating vehicles? (i.e., old vehicles may appear as registered by they are barely used in reality)
- According to the authors, "annual emissions have been calculated by summing the hourly emissions to get daily emissions and then multiplying with 365". By doing this, authors are assuming that for all days of the week (Monday to Sunday) and all months of the year (January to December) traffic activity and emissions present the same intensity. However, traffic activity and associated emissions typically present a drop during weekends when compared to weekdays, and they can also present drops/increases during certain months of the year. Is this not the case for Delhi? Can the authors provide some information that support they hypothesis (i.e. emissions are constant throughout the year).

Other comments:

- Particulate matter emissions are usually expressed as PM (regardless of the fact that they include or not non-exhaust emissions). I would recommend to change the acronym from PME to PM - In the text the authors already specify that PM emissions only include exhaust - and also specify if this PM equals PM10 and/or PM2.5.
- "In this study we have shown a data driven approach where the quality of input data is likely to improve the emission estimates." I believe this is a too strong conclusion. Emission results from this work differs significantly from previous estimates as it makes use of more updated and refined information, but it cannot be concluded that the estimates have been improved. In order to say that, an evaluation of the emission dataset should be performed by, for instance, performing an air quality modelling study and comparing the results against observations.