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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Nepal Emission Inventory (NEEMI): a high resolution technology-based bottom-up emissions inventory for Nepal 2001–2016" *by* Pankaj Sadavarte et al.

Anonymous Referee #1

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A very useful, data rich, and rather well documented paper that deserves publication. However, in my view, it needs some revisions. It would benefit from shortening of the more general sections of the main text while more extensive and especially more focused discussion of results and comparison to other work.

One of the key issues is completeness of the inventory and consequently a decision about the content of the paper. The title indicates it is complete inventory, however, it focuses on anthropogenic and primary combustion sources. If it shall remain as such then the title should be modified and a clear statement about the content should be made already in the abstract. Considering the sources that are currently covered (a

table summarizing the coverage would be a great help) I do not see why the N2O and CH4 is at all included since vast majority of emissions originate from sources NOT included in this work (agriculture, waste). Therefore, I'd suggest to remove these species from the inventory OR complete the dataset with agriculture (livestock, fertilizers, rice) and waste (use and refer to the results of the Das et al, 2018 paper).

Few other comments about the source coverage; - For CO2, it might be useful to specifically show the fossil fuel emissions vs biofuel emissions, possibly giving also a clear information about the assumptions about the non-sustainability of wood supply - it is mentioned but I have not found a clear explanation of assumptions. Since also the CO2 from open biomass burning (agricultural residue) is included in the total it woudl be good to separate it from fossil fuel CO2. - For NMVOC, according to my understanding the solvent use and losses from liquid fuel storage distribution and not included - it would be useful to add a few sentences about the potential contribution of those (it will be rather small I assume but still worth mentioning for completeness and in the future these sources might be gaining in importance). One potentially more important source that might be missing (?) are evaporative emissions from gasoline vehicles - I am not sure if the emission estimates include these in emission factors or not. - The authors mention the Das et al (2018) paper where emissions from waste burning are estimated; I'd suggest to include results of that paper here and quote that for this source emissions come from that paper as these are relevant for all air pollutant species and so the presented inventory would be more complete. - Emissions of SO2 from residential sector are typically not a major source and so it is the case in Nepal but considering the large role solid fuels play in the energy balance the contribution seems very small and I was wondering if the authors should not review the assumptions about the SO2 emission factors used for biomass. - It is not clear if the non-exhaust emissions from transport (brake wear, tyre wear) are included or not.

Comparison to other studies; obviously there is not a lot to compare to but I believe one could add few more sources, like the CMIP6 dataset (Hoesely et al., 2018) where

annual estimates until 2014 were made and are available at sectoral level too, then also the EDGAR inventory (Crippa et al), and GAINS model work where the ECLIPSE project dataset is available (Klimont et al, 2017). The currently presented comparison provided in Fig 7 and one page of discussion comes short (in my view) of what could be discussed as the comparison could serve highlighting, for example key uncertainties or elements that are not well represented or out of date in the regional and global products.

BC and OC emission factors for transport sources. While the Bond et al (2004) work certainly provides a great starting point the shares presented there referred submicron PM so one needs to carefully use those numbers (for transport where exhaust PM emissions are primarily in submicron fraction this is probably fine). However, there has been a lot more work done assessing diesel carbonaceous emissions, including work in Asia and also how the BC share changes in vehicles with more advanced emission standards - something that seems to be ignored here; please review the possibility of using also some more recent studies and consider the extent to which for more recent vehicles the factors might be different. It is not clear form the current text, if the data about the share of fuel used by vehicles complying with different Bharat standards is available and explicitely used or not. There has been few more studies looking at high emitters and the implications for emissions. It might be useful to add few more lines of discussion and in the result section highlight the importance of this source for specific pollutants - even show this in the charts explicitely as it offers a good policy target.

Continuing on the above, but for stationary sources, the use of BC and OC shares of PM2.5 where the abatement technologies, like particulate filters, are not considered is problematic since application of such filters changes the size profile (not reducing emissions of all PM species equally). Even if such information is not available as yet, it should be mentioned and for power plants and industrial boilers the installation of such stack control technology will become reality sooner or later.

The aviation sector - The autors state in line 23-24 on page 11 that it is not included

but in several parts of the manuscript and also all energy graphs aviation is mentioned. It should be made consistent.

On page 15, line 23 - one of the paper has 'way to high' emisison factors....it woudl be good to add some more justification to why this study is excluded ...or maybe shoudl not be mentioned at all if it is wrong.

Section 3.1.1 mentions also burning of ag residues but i would not include this under 'national energy trend"

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