Responses to Anonymous Referee #1:

This manuscript presents a new methodology to look at the emissions base from the consumer perspective. This will help ascertain the footprint of various pollutants in the cities and the regions, similar to the carbon footprint.

Response: We appreciate the insightful and constructive comments from referee #1. We deal with individual comments as below.

When the topic of air pollution is at the center, is it important to look at the emission rates from the production perspective or the consumption perspective? At the end of the day, while the products are manufactured and exported to various provinces or inter nationally, the emissions are not. Their impact is still local and that is not transported.

This work, while presents a new perspective, the problem of air pollution is still where the emissions are and not where the consumers are. While the message is not to stop manufacturing for trade, this is still at the center of the discussion - how much of these emissions are resulting from producing products not for use locally? One could extend the current analysis, from the production perspective to show the footprint of emissions from local consumption and from trade.

Response: Thanks for the insightful comments. In the Sect. 3.1 of the revised manuscript, we presented the footprint of emissions from production perspective by dividing production-based emissions of each province to three parts: emissions from local consumptions, from consumptions in other provinces through interprovincial trade, and from international consumptions. On average, we found that emissions from local consumptions contributed 62%, 46%, 46%, and 56% of national total emissions for primary $PM_{2.5}$, SO_2, NO_x, and NMVOC respectively, with large variations among different provinces.

Quantification of emissions from both production and consumption perspective will help to identify national or regional responsibility for emission mitigation, and help the developing regions with lower consumption-based emissions gain more supports from developed regions. The importance of consumption-based emission accounting has been emphasized in many studies on global and regional CO_2 emissions (e.g., Peters, 2008; Davis and Caldeira, 2010; Feng et al., 2013). For the first time, our manuscript estimated air pollutant emissions in China from production and consumption perspective at provincial level, by quantifying emissions embodied in interprovincial and international trade of products. This will help policy makers better understanding their responsibilities to air pollution by identifying emissions induced by their consumption activities.

In the meanwhile, tracking emission flows embodied in trade can help to attribute local air pollution to different consumption types, e.g., local vs. regional. With the consumption-based emission inventory developed in this work, we will able to further separate the relative contribution of air pollution by local consumption and regional consumption, by using source-oriented air quality models. Clarifying these relationships will help local government to find an effective way to optimize air quality management decisions toward environmentally sustainable economic growth. Thus, it is of great important to look at emissions from both production and consumption perspective.

References:

Davis, S. J., and Caldeira, K.: Consumption-based accounting of CO_2 emissions, P. Natl. Acad. Sci. USA, 107, 5687-5692, 2010.

Feng, K., Davis, S. J., Sun, L., Li, X., Guan, D., Liu, W., Liu, Z., and Hubacek, K.: Outsourcing CO_2 within China, P. Natl. Acad. Sci. USA, 110,11654-11659, doi: 10.1073/pnas.1219918110, 2013.

Peters, G. P.: From production-based to consumption-based national emission inventories, Ecol. Econ., 65, 13-23, 2008.