

Anonymous Referee #2

China's policy on air pollution control has changed significantly in the past decades, which is expected to influence the air quality and its associated health impact. Certainly, it is of great importance to quantitatively understand the achievement on pollution mitigation and the related health effect. This work is intended to investigate the decadal change of anthropogenic emission sources and the contribution to PM_{2.5} mitigation since 1990. Based on a bottom-up emission inventory, regional chemical transport model, and the exposure mortality estimation, this study quantified the change in anthropogenic emission intensity and the resultant mortality due to PM_{2.5} variations. Overall, this manuscript is well structured and also well written. It also provided some possible policy implementation for pollution control. Here are some comments to be addressed, after which I think it is worth publishing in this journal.

Response: We appreciate the Referee's positive tone. Below we have point-by-point addressed the Referee's comments.

1. Apart from PM_{2.5}, ozone also has great negative effects on human health, worsening chronic respiratory diseases such as asthma and compromise the ability of the body to fight respiratory infections. As emissions change in the past decades, ozone level varies in response, and so does its influence on health. Have the premature mortality data or model used in this study considered it?

Response: Besides PM_{2.5}, ozone also has adverse health effects. In this study, we restricted our focus on the source contribution of PM_{2.5} pollution and related health, and have not considered the impact of ozone yet. The health effects of ozone can be analyzed in another study in the future. We clarified our research focus in Section 2.3: *“Besides PM_{2.5}, ozone also has adverse health effects. In this study, we focus on the premature mortality due to the long-term PM_{2.5} exposure and did not consider the impact of ozone.”*

2. In section 3, it is a little bit tedious to just describe China's air pollution regulations.

Also, more analysis on pollution regulation change and long-term emission variation may improve the clarity. Thus, a timeline chart of both pollution regulation and emission inventory is suggested to be added here.

Response: Accepted. Referee #1 also suggested to add discussion on the changes of emission in response to policies. Therefore, we have rearranged the paragraph in Section 3 with additional information on the changes of emissions from Table 2:

“Table 1 lists the development sequence of the major air quality regulations in China, Figure S4 shows the timetable of the emissions standards implemented in the major sectors during past decades, and Table 2 presents the annual emissions of SO₂, NO_x, PM_{2.5}, and NH₃ contributed by agriculture, industry, power, residential and transportation sectors.....However, these measures did not keep up with the rapid growth of economy and fossil fuel use, and the national emissions SO₂, NO_x and PM_{2.5} had increased by 142%, 207%, and 54% from 1990 to 2005..... In response, the national SO₂ emission dropped from 33.0 Mt to 27.8Mt, by 16% in period of 2005-2010, which was even greater than the target reduction rate of 10%. But the NO_x emission kept growing during the Eleventh FYP due to limited end-of-pipe measures, and started to drop during the Twelfth FYP.....As a result, the SO₂, NO_x and PM_{2.5} emissions in 2015 had decreased dramatically by 39%, 10% and 22%, compared with the levels in 2010.”

3. Page 1 Line 17: Does “CI” stand for “Confidence Interval” here? Full expression is recommended for the first time of the statement.

Response: Accepted. “CI” stands for “Confidence Interval”. We have revised it as “1.26 million [95% Confidential Interval (95% CI): 1.05, 1.46]” for the first time of the statement.

4. Page 2 Line 12: Quantification of the pollution level would be more rigorous, like how many times of average PM concentration in the area compared with WHO or China national standard?

Response: Accepted. We have quantified the pollution level by comparison with China

national standard and added information below for clarify.

“During 2013-2014, only three out of the thirty-one provincial capital cities in China had the $PM_{2.5}$ annual concentration below the national standard grade II of $35 \mu\text{g m}^{-3}$, and the highest concentration of $144 \mu\text{g m}^{-3}$ occurred Shijiazhuang, which were over three times higher than the standard (Wang et al., 2014).”