

Estimation of PM_{2.5} Contribution and Premature Deaths for Major Emission Sources in Korea

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The Korean government is implementing aggressive and strong policies that have not been available to improve PM_{2.5}. The government has set efforts to reduce domestic PM_{2.5} at 20% during the high concentration season (December-March) and is making various efforts, including shutting down coal-fired power plants. Although the impact of pollutants from foreign countries is large due to the geographical characteristics of Korea, efforts are needed to reduce domestic emissions.

Korea has a small area with high population density, many automobiles and dense industrial facilities. In addition, since the three sides are in contact with the sea, it is necessary to manage ship emissions. Since there are lots of pollutants from various sources in such a small area, it is more important to understand the PM_{2.5} contribution of each emission sources to reduce PM_{2.5} concentration.

Although the government pointed out that coal-fired power plants will be the main source to PM_{2.5}, industrial complexes and ship emissions need to be considered to prepare efficient PM_{2.5} policy making.

Based on these backgrounds, this study estimated the contribution of PM_{2.5} and the number of premature deaths to major sources (coal-fired power plants, major industrial complexes, ship emissions). Contribution concentrations were estimated using WRF, CMAQ / BFM.

In case of industrial complex, estimated annual average PM_{2.5} contribution by 3 major industrial complexes shows 1.25 $\mu\text{g}/\text{m}^3$. The contribution from domestic ship emission is 0.57 $\mu\text{g}/\text{m}^3$, which is about 2% of the annual average concentration of 26 $\mu\text{g}/\text{m}^3$ in Korea. An interesting result is that the contribution of ship emissions is similar to or even higher than that of coal-fired power plants(0.51 $\mu\text{g}/\text{m}^3$).

BenMAP was used to estimate the number of premature deaths cause by PM_{2.5}. The number of premature deaths from 3 major industrial complexes, coal-fired power plants and ship emission were estimated 1472, 796 and 863, respectively.