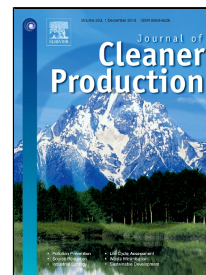


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Analysis of the impacts of heating emissions on the environment and human health in North China

Han Li^{a, b}, Shijun You^{a, b}, Huan Zhang^{a, b}, Wandong Zheng^{*, a, c}, Lanjun Zou^d

^aSchool of Environmental Science and Engineering, Tianjin University, Tianjin, China

^bKey Laboratory of Efficient Utilization of Low and Medium Grade Energy, MOE, Tianjin University, Tianjin 300350, PR China

^cState Key Laboratory of Building Safety and Built Environment, China Academy of Building Research, Beijing, 100013, China

^dShanghai Central Meteorological Observatory, Shanghai, China

Abstract:

Cities in North China are facing serious air pollution problems including high concentrations of particles, SO₂, and NO_x due to heating emissions. The exposure to air pollutants, especially PM_{2.5}, is highly correlated to various adverse health impacts. However, few studies focused on the impact of heating emissions on the environment and health in China. This study aims to address the above-mentioned issues in North China by selecting 62 typical cities with different pollution levels and heating energy consumption as study objects. The heating environment index and PM_{2.5} concentration were used to show the environmental impact of heating emissions. With respect to the health aspect, eight health endpoints, including the all-cause mortality, cardiovascular mortality, respiratory mortality, lung cancer mortality, chronic bronchitis, cardiovascular diseases, asthma attacks, and acute bronchitis, were evaluated. The results show that the air quality index considering heating emissions is 118.4 [95% confidence interval (CI): 111.5 to 125.2], while that without heating emissions is only 74.3 (95% CI: 68.6 to 79.9). The heating environment index is 0.64 (95% CI: 0.60 to 0.68). The proportion of polluted cities (i.e., with an air quality index larger than 100) is 77.42% considering heating emissions, while it is only 17.74% without considering heating emissions. The average PM_{2.5} concentration during the heating season in the study region is 75.3 µg/m³ (95% CI: 68.2 to 82.5) and 47.7 µg/m³ (95% CI: 42.6 to 52.7) with and without considering heating emissions, respectively. In terms of the health impact, the total number of premature deaths attributable to heating emissions in the studied cities is 51154, accounting for 0.18‰ of the total population. The analysis shows that heating emissions are the major cause of the health endpoints during the heating season in most cities in North China. This study helps to confirm the quantitative environment and health impacts caused by heating emissions to timely reduce the damage to the human health of residents in North China.

*Corresponding author. Tel: +86 22 2789 2626; fax: +86 22 2789 2626.
E-mail address: wdzheng@tju.edu.cn.

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