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The underappreciated role of transboundary pollution in future air quality and health improvements in China

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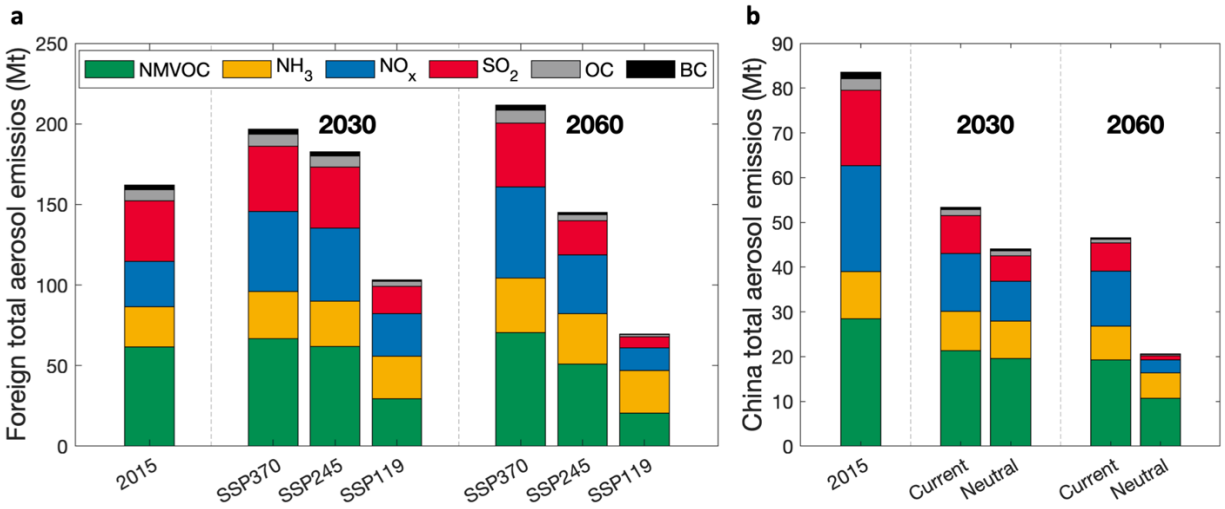

Figure S1. Future emissions of $PM_{2.5}$-related pollutants in China and in other countries. **(a)** Emissions for foreign countries within our Flex-Grid simulation domain (11° S–60° N, 30°–150° E) for future years are projected under SSP-RCP scenarios, with updates on base year emissions and the harmonization year in this study. Colors represent the emissions of different pollutants following the legend. **(b)** Emissions for China for future years are projected with the current-policy scenario and the carbon-neutral scenario.

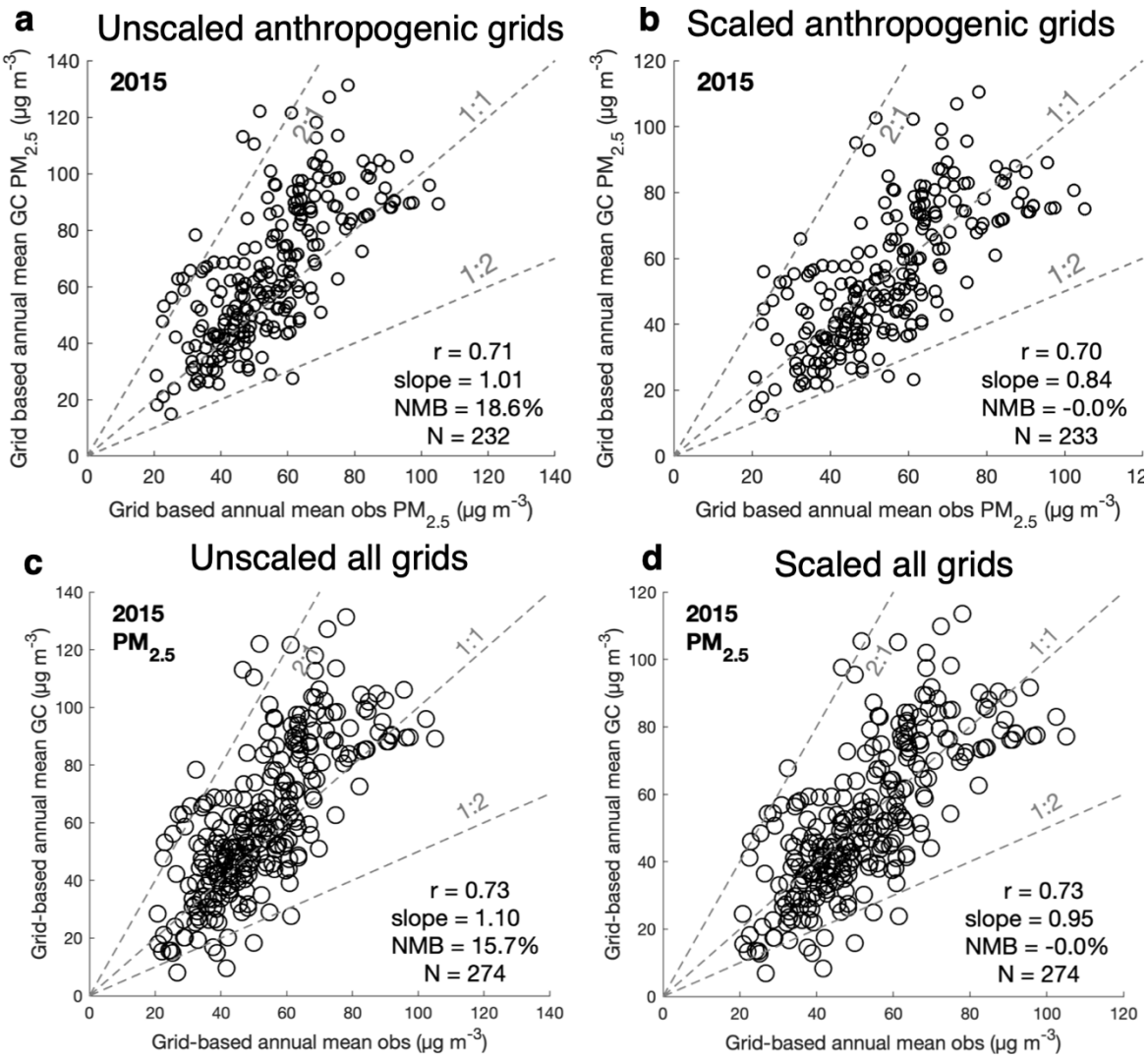

Figure S2. Correction and evaluation of simulated $PM_{2.5}$ over China. **(a)** Comparison of the observed and unscaled simulated annual mean concentrations $PM_{2.5}$ at collocated grids for 2015. Both the observed and the simulated $PM_{2.5}$ were in grids where anthropogenic $PM_{2.5}$ exceeds natural $PM_{2.5}$. r refers to the correlation coefficient. NMB refers to normalized mean bias. N indicates the number of grids shown in the figure. **(b)** Same as (a), but for scaled simulated $PM_{2.5}$ concentrations to remove the systematic bias. **(c)** Same as (a), but for all grids (including both anthropogenic pollution-dominated and natural pollution-dominated grids). **(d)** Same as (b), but for all grids.

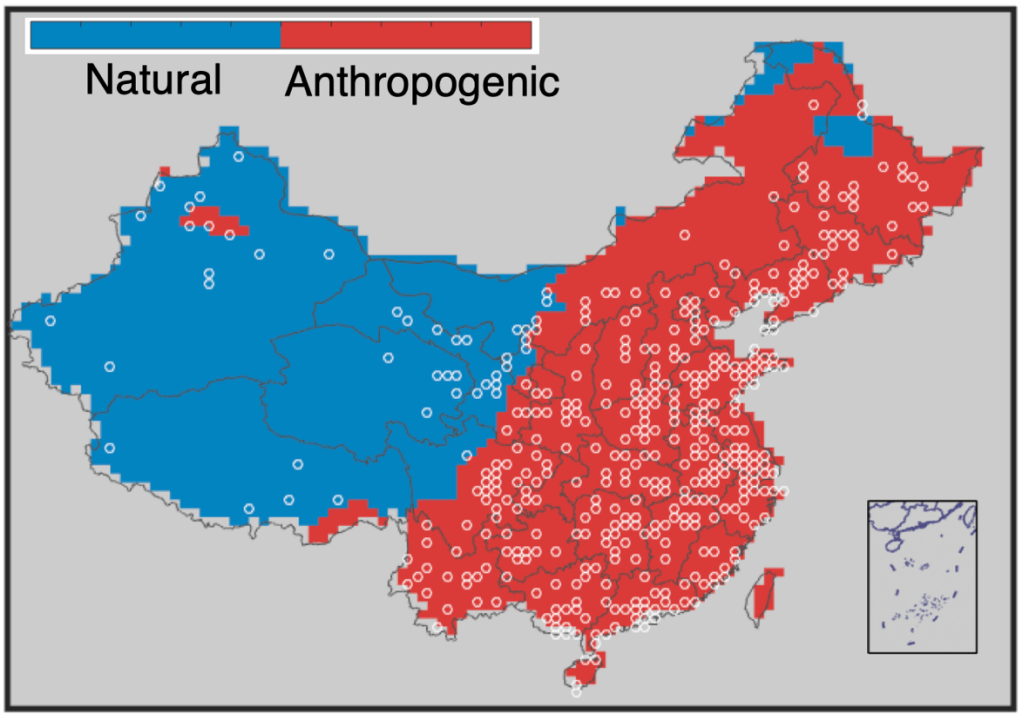

Figure S3. Anthropogenic emission-dominated grid cells (red) and natural emission-dominated grid cells (blue) at a 0.5° x 0.625° resolution in China. Circles indicate locations of $PM_{2.5}$ observations used in this study.

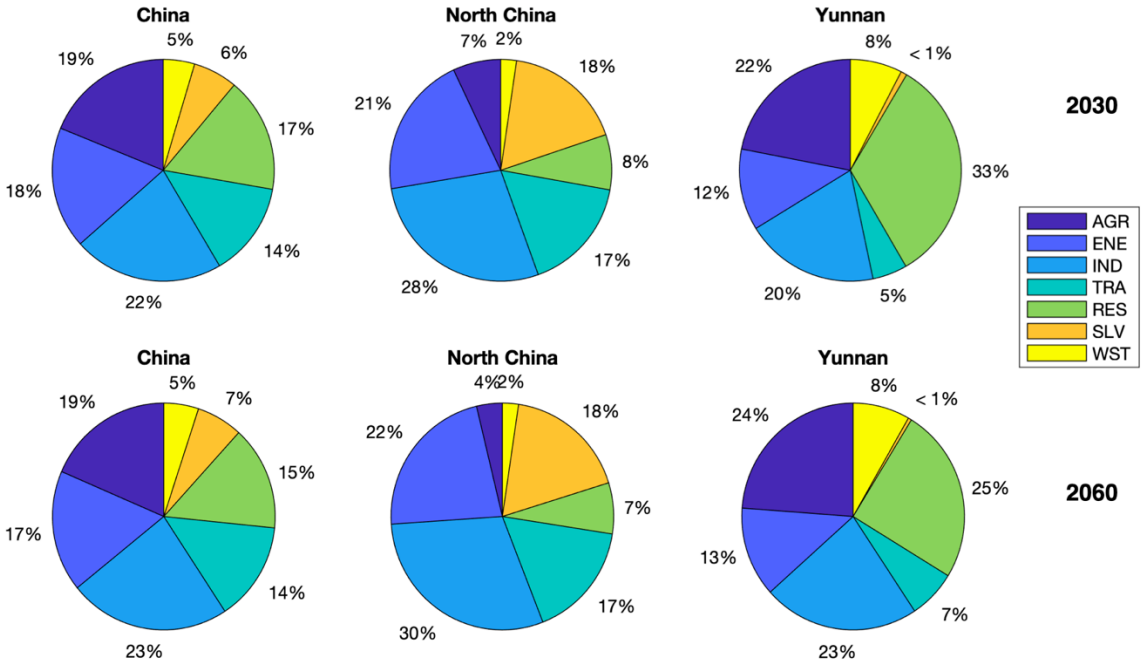

Figure S4. Simulated sectoral contributions of foreign anthropogenic emissions to $PM_{2.5}$ concentrations over the entire China, North China and Yunnan province for January in 2030 (top) and in 2060 (bottom) under the current-policy scenario in China and SSP370 scenario in foreign countries. Sectors include agriculture (AGR), energy (ENE), industry (IND), transportation (TRA), residential combustion (RES), solvent use (SLV), and waste burning (WST). The simulation is conducted at a resolution of 2° x 2.5°.

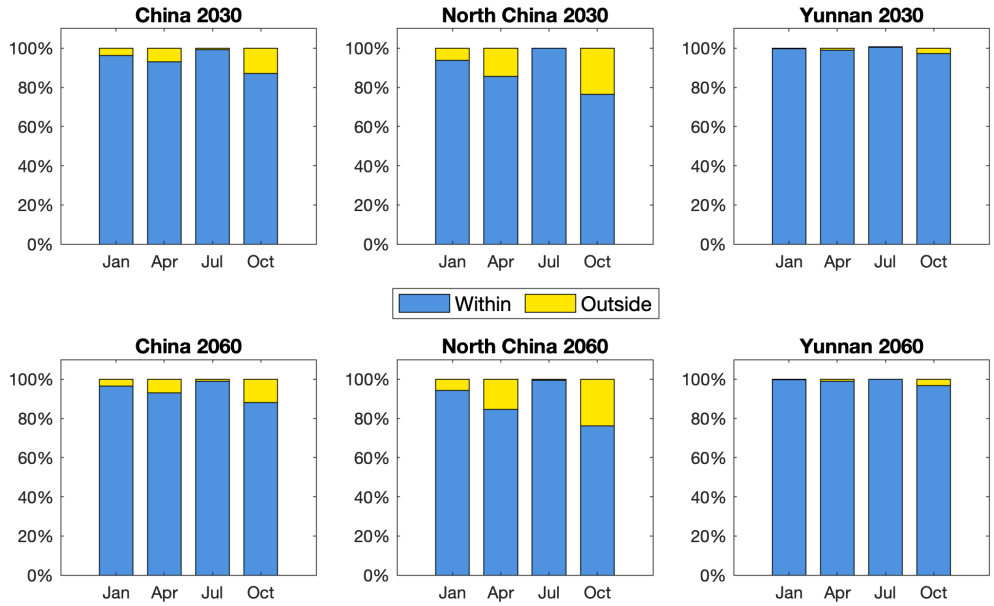

Figure S5. Fractional contributions of foreign anthropogenic emissions from countries within and outside the Flex-Grid domain (11° S–60° N, 30°–150° E, including the entire Asia, eastern Africa and eastern Europe) to $PM_{2.5}$ concentrations over China, North China and Yunnan province in 2030 (top) and in 2060 (bottom) under the current-policy scenario in China and SSP370 scenario in foreign countries. The simulation is conducted at a resolution of 2° x 2.5°.

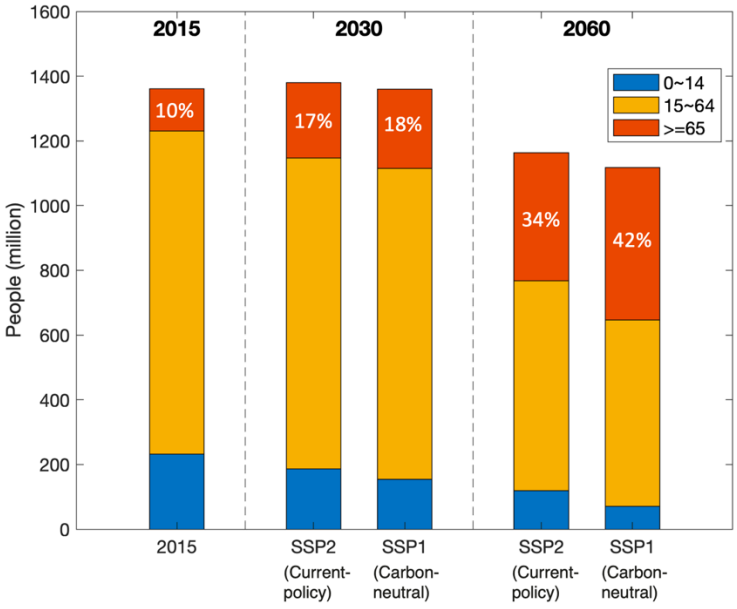

Figure S6. Future population and age structure in China. Total populations in China in 2015 and future years projected under different SSP scenarios (SSP1 corresponds to China's carbon-neutral scenario; SSP2 corresponds to China's current-policy scenario). Colors represent different age groups according to the legend. White numbers indicate the fraction of population above the age of 65 in the total population.