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Energy and metal contamination in the rapidly urbanizing China

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Metals have been identified as the most important inorganic contaminants in Chinese natural soils according to the nation soil pollution survey bulletin in 2014. We investigated metal contamination in urban soils and sediments in the Yangtze River Delta city cluster and meta-analyzed integrated metal pollution index in 21 Chinese cities nationwide. Metal contamination in urban soils and sediments showed clear urbanization-driven patterns along city-rural and multi-city gradients. Meanwhile, combining the Pb stable isotope ratio analysis and ^{210}Pb dating techniques, coal combustion emission was identified as a dominant source for Pb contamination in Shanghai currently and in the past century. By reviewing the coal consumption over the rapid urbanization period and metals in the main coal sources, metals from the coal consumption showed very serious environmental problems in China even though the new combustion technology application has reduced sound amounts of metal emissions since 2006. Changes of energy structure in the past 60 years were analyzed in China. It pointed out that although percentage of coal consumption in the national energy structure significantly dropped to less than 70% but the consumption amount was dramatically increased up to 2.5 billion metric tons by 2013 with the total energy consumption increasing. Meanwhile, crude oil prices shifted by the mid-east wars significantly altered energy structure in China although green energy composition is recently increasing up to 18% by 2013. The green energy includes hydropower, natural gas, nuclear, solar and wind. To meet the future development goals, clean energies should be considered to substitute for coal in China for alleviating current serious air pollution.

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