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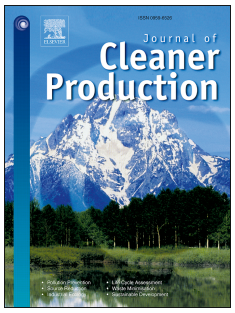

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Patterns of CO_2 emissions in 18 central Chinese cities from 2000 to 2014

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Abstract

With the Rise of Central China Plan, the central region has had a great opportunity to develop its economy and improve its original industrial structure. However, this region is also under pressure to protect its environment, keep its development sustainable and reduce carbon emissions. Therefore, accurately estimating the temporal and spatial dynamics of CO_2 emissions and analysing the factors influencing these emissions are especially important. This paper estimates the CO_2 emissions derived from the fossil fuel combustion and industrial processes of 18 central cities in China between 2000 and 2014. The results indicate that these 18 cities, which contain an average of 6.57% of the population and 7.91% of the GDP, contribute 13% of China's total CO_2 emissions. The highest cumulative CO_2 emissions from 2000 to 2014 were from Taiyuan and Wuhan, with values of 2268.57 and 1847.59 million tons, accounting for 19.21% and 15.64% of the total among these cities, respectively. Therefore, the CO_2 emissions in the Taiyuan urban agglomeration and Wuhan urban agglomeration represented 28.53% and 20.14% of the total CO_2 emissions from the 18 cities, respectively. The three cities in the Zhongyuan urban agglomeration also accounted for a second highest proportion of emissions at 23.51%. With the proposal and implementation of the Rise of Central China Plan in 2004, the annual average growth rate of total CO_2 emissions gradually decreased and was lower in the periods from 2005 to 2010 (5.44%) and 2010 to 2014 (5.61%) compared with the rate prior to 2005 (12.23%). When the 47 socioeconomic sectors were classified into 12 categories, "power generation" contributed the most to the total cumulative CO_2 emissions at 36.51%, followed by the "non-metal and metal industry", "petroleum and chemical industry", and "mining" sectors, representing emissions proportions of 29.81%, 14.79%, and 9.62%, respectively. Coal remains the primary fuel in central China, accounting for an average of 80.59% of the total CO_2 emissions. Industrial processes also played a critical role in determining the CO_2 emissions, with an average value of 7.3%. The average CO_2 emissions per capita across the 18 cities increased from 6.14 metric tons in 2000 to 15.87 metric tons in 2014, corresponding to a 158.69% expansion. However, the average CO_2 emission intensity decreased from 0.8 metric tons/1,000 Yuan in 2000 to 0.52 metric tons/1,000 Yuan in 2014 with some fluctuations. The changes in and industry contributions of carbon emissions were