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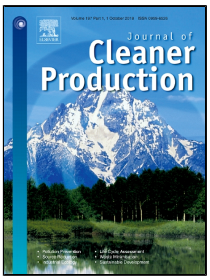

CO_2 emissions from China's power industry: policy implications from both macro and micro perspectives

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ABSTRACT

China has become the global largest CO_2 emitter, and CO_2 emissions from China's power industry account for almost half of the total. Therefore, the power sector plays a key role in achieving low-carbon economy. It is imperative to formulate comprehensive policy implications for the power sector from both macro and micro perspectives to achieve the target of emission reduction. This paper selected seven socio-economic and technological factors involved in the whole power industry to investigate the mechanism driving CO_2 emissions based on the extended STIRPAT model. The results show that the order of factors' absolute elasticity coefficients is GDP per capita (0.245) > power generation efficiency (-0.237) > power consuming efficiency (-0.189) > line loss rate (-0.184) > electricity practitioner population (0.143) > industrial structure (0.082) > generation structure (0.068). Further, it is necessary to discuss how a specific power enterprise responds under the low-carbon generation policy to maximize its own interest. The evolutionary game model between power enterprise and government is established and results indicate that it is critical to slash low-carbon production cost, enhance returns on low-carbon production and strengthen the regulation of power enterprises, and reduce the supervision cost of government. Accordingly, policy recommendations are proposed from both macro and micro perspectives for CO_2 emission reduction of power industry.

Keywords: CO_2 emissions; Power industry; Driving factors; STIRPAT; Evolutionary game; Policy implications

1. Introduction

It is believed that global warming is mainly due to greenhouse gas (GHG) emissions, especially CO_2 emissions caused by rapid development of industrialization (Cui et al., 2018b). Current research indicates that more than two-thirds of greenhouse effects are from energy-related CO_2 emissions continually increasing in the future (Meng and Niu, 2011). The power industry is a momentous energy-related CO_2 emitter, whose global emissions share has increased from 36% in 1990 to 42% in 2014, and is forecasted to be 45% in 2030 (IEA, 2016; Sun et al., 2016a).

China has witnessed a prominent economic growth recently, and meanwhile has become the largest CO_2 emitter in the world, contributing almost a quarter of total global emissions (IEA, 2016). Based on International Energy Agency (IEA), CO_2 emissions caused by fuel combustion in China

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