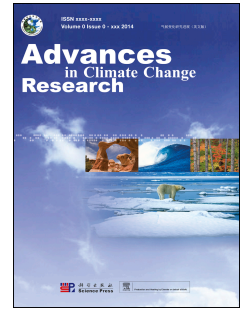


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Decoupling economic growth from CO₂ emissions: A decomposition analysis of China's household energy consumption

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Abstract: This paper analyzes Chinese household CO₂ emissions in 1994–2012 based on the Logarithmic Mean Divisia Index (LMDI) structure decomposition model, and discusses the relationship between household CO₂ emissions and economic growth based on a decoupling indicator. The results show that in 1994–2012, household CO₂ emissions grew in general and displayed an accelerated growth trend during the early 21st century. Economic growth leading to an increase in energy consumption is the main driving factor of CO₂ emission growth (an increase of 1.078 Gt CO₂) with cumulative contribution rate of 55.92%, while the decline in energy intensity is the main cause of CO₂ emission growth inhibition (0.723 Gt CO₂ emission reduction) with cumulative contribution rate of 38.27%. Meanwhile, household CO₂ emissions are in a weak state of decoupling in general. The change in CO₂ emissions caused by population and economic growth shows a weak decoupling and expansive decoupling state, respectively. The CO₂ emission change caused by energy intensity is in a state of strong decoupling, and the change caused by energy consumption structure fluctuates between a weak and a strong decoupling state.

Keywords: Household energy consumption; CO₂ emissions; LMDI model; Decoupling indicator.

1 Introduction

In 1896, Swedish scientist Svante Arrhenius mentioned that CO₂ emissions could lead to global climate warming. With economic development, industrialization becomes an inevitable route for every country. The series of problems caused by CO₂ emissions have become more and more important, and draw a great deal of attention from society. In 2013, the IPCC Fifth Assessment Report (IPCC, 2013) pointed out that human activity has been the dominant cause of observed warming since 1950, and the certainty is up to 95%. Meanwhile, in the past 130 years, global temperature has risen by 0.85 °C, and in the future, big cities will be the main source of CO₂ emissions, caused by human activities.

China has achieved the goal of rapid economic growth since its Reform and Opening-up. However, as the economy grows, China has surpassed the U.S. to become the biggest carbon emitter in 2013 (Friedlingstein et al., 2014). In China, the proportion of energy consumption in the industrial sector has remained at more than 80%, which is the main reason why China's energy consumption and CO₂ emissions are growing rapidly. Hence, policies and researches on the energy crisis and CO₂ emission control are mainly focused on the industrial sector, ignoring the household sector, which is at the lower end of energy consumption. With urbanization, a tremendous change has occurred in the lifestyle of China's citizens, and household energy

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