



Driving forces in energy-related carbon dioxide emissions in east and south coastal China: commonality and variations



Chaochao Gao ^a, Yonghong Liu ^a, Jun Jin ^b, Taoyuan Wei ^c, Jianying Zhang ^a,
Lizhong Zhu ^{a,*}

^a Department of Environmental Science, Zhejiang University, Hangzhou 310058, China

^b School of Management, Zhejiang University, Hangzhou 310058, China

^c Center for International Climate and Environmental Research – Oslo (CICERO), 0318 Oslo, Norway

ARTICLE INFO

Article history:

Received 17 August 2015

Received in revised form

20 April 2016

Accepted 21 May 2016

Available online 28 May 2016

Keywords:

Decomposition analysis

CO₂ emission

Driving force

Coastal China

Provincial feature

ABSTRACT

As the world's top carbon dioxide emitter, China is expected to reach its emissions peak by 2030. East and south coastal China contribute nearly one-third of the emissions in China, and therefore play a critical role in achieving the national goal of emission control. This study analyzes the driving forces of east and south coastal China's energy-related emissions and their provincial characteristics by applying the log-arithmetic mean division index method. The emissions in this region were found to double from 2000 to 2012, along with three and two folds increase in the economy and energy consumption. The result suggests a persistent connection between economic growth and emission even in this socioeconomically advanced region. The per capita emissions are lower than most regions of China at a given economic level, and are expected to be lower than select developed nations when reaching their corresponding economic levels. Energy efficiency has been the leading force in reducing emission growth, and we differentiate the provinces into three distinct low-carbon developmental stages. There is no significant influence from either the economic or energy structure change, indicating great emission reduction potential from structure decarbonization especially when compared to advanced nations. These results suggest that the dual effort of enhancing energy efficiency and decarbonizing the economic and energy structure would probably serve the goal of total emission control more effectively and efficiently, and factor driven emission reduction strategies are needed in these geographically and socioeconomically similar regions. The study expands on the current knowledge by analyzing the interprovincial commonality and variation of this pilot region in China, and therefore provides a stepwise view of the emission driving forces for emerging economies.

© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

Over the past decade, China has become the world's second largest economy and the top carbon dioxide (CO₂) emitter (Jos et al., 2013), attracting global concerns of its environmental impact (Liu et al., 2013). Hence, China plays a key role in reducing global emissions. On November 12, 2014, it took a step in pledging to “stop its emissions from growing by 2030 at the latest” (Schiermeier, 2014). On June 30, 2015, in an official document submitted to the Secretariat of the United Nations Framework Convention on

Climate Change, the Chinese government solemnly committed to cut its CO₂ emissions per unit of gross domestic product (GDP) by 60–65% by 2030 relative to its 2005 levels, and peak CO₂ emissions around 2030 and make best efforts to peak earlier (UNFCCC, 2015). Though the targets are clearly set, challenges remain as to how to realize the dual goals of curbing energy use and emissions while sustaining economic growth. Given China's vast geographic scale and diverse regional developmental stages, it is essential to acquire a strategic understanding of the carbon emission characteristics and the underlying driving forces in its different regions, in order to establish a broadly acceptable and efficient emission reduction agenda.

East and south coastal China, especially the coastal provinces of Shandong, Jiangsu, Zhejiang, Fujian, and Guangdong plus

* Corresponding author. Tel./fax: +86 571 88982489.
E-mail address: zlz@zju.edu.cn (L. Zhu).

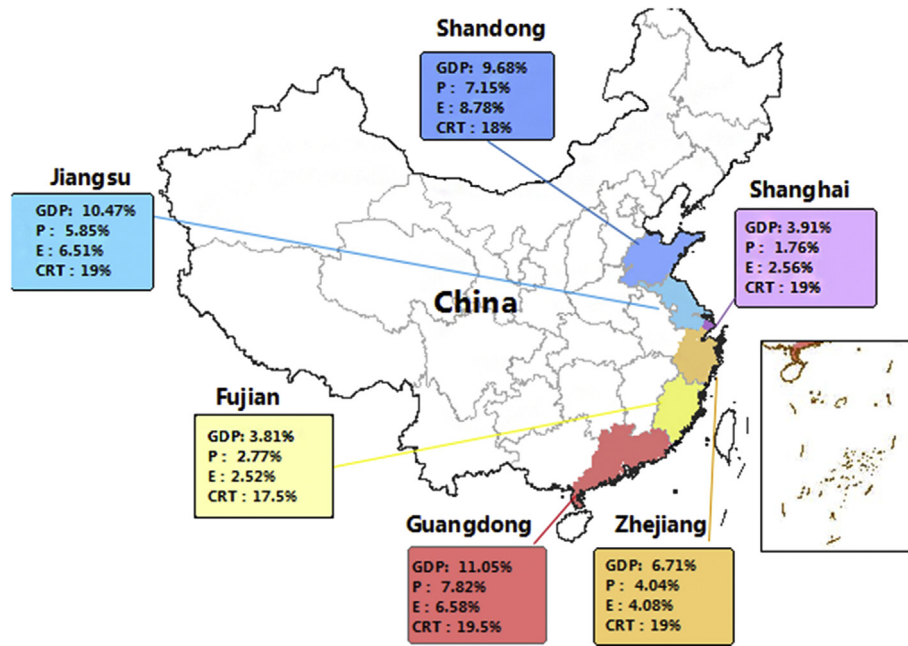


Fig. 1. Location and general information of the study area. *P* and *E* represent percentages of population and energy consumption, respectively, of the six individual provinces with respect to the national population and total energy consumption in 2012, and the values are calculated based on the data from the 2012 national statistics (NBSC). CRTs represent the carbon emission intensity reduction targets in the 12th Five Year Plan, and the data are from the National Development and Reform Commission (NDRC).

Shanghai municipality (hereafter referred to as “the Region”¹ or the “six coastal provinces”, Fig. 1), were the earliest regions to carry out the reform and opening up policy since 1978 and the pilot ship for most of the nation's strategic programs. It includes China's two strategic economic zones – the Yangtze River Delta region including the entire territory of Jiangsu, Shanghai, and Zhejiang, and the Pearl River Delta consisting of most parts of Guangdong – and accounts for one-third of the total national emissions during 2003–2010 (Guan et al., 2012). It is also the region with the highest energy efficiency in China but bear the higher emission reduction targets set by the central government (He et al., 2013), taking up earlier emission reduction responsibility than the less developed regions (Zhou et al., 2014). Though geographically occupying a small area of China (Fig. 1), the six coastal provinces account for nearly 30% of the national population and contribute almost half of the national GDP (NBSC, 2001–2013a). From the global perspective, the Region's GDP is 76.2% and 19% of that of Japan and the European Union (EU), respectively, and it contributes to nearly 8% of the world's carbon emissions (IEA, 2013). It occupies twice the area of Japan or Germany and its population size is 3 times that of Japan or 79% of that of the EU. Therefore, it is an important region to study the driving forces and emission reduction potential.

¹ The classification of east and south coastal China in this study is slightly different from that in Zhou et al. (2014), which defined Shanghai, Jiangsu, and Zhejiang as belonging to the eastern coast and Fujian, Guangdong, and Hainan as belonging to the southern coast. This study focuses on the economically developed provinces in southern and eastern coastal China, which were among the first to implement the reform and opening up policies. Shandong is included as an eastern coastal province because it has similar economic and energy structure as the other five provinces (NBSC, 2001–2013a), and has been categorized as an eastern coastal China province on various occasions (Fang, 2007). Hainan is excluded because it is an island province with a per capita GDP below the national average (NBSC, 2001–2013a).

Despite the Region's importance, none of the previous studies, to our knowledge, has focused solely on this region. Song et al. (2015) analyzed the energy consumption and carbon emissions in the Yangtze River Delta region, and attributed their growth mainly to increasing economic development and population. Other studies looked at the individual provinces under the national framework, and this may have contributed to the discrepancies in assessment of the provinces in different studies. For example, Wang et al. (2013) found that Shanghai and Guangdong, together with Beijing, attained the highest energy and environmental efficiency, while Guan et al. (2014) found Guangdong and Jiangsu to be the only two provinces to become cleaner in both individual industry and economic composition.

Therefore, this study chooses the vital yet rarely studied coastal region, and presents a detailed analysis on the driving forces of its energy-related emissions. The goal is to identify the provincial lessons for China to achieve its emission reduction target, by province targeted policies and strategies. An integral understanding of the emission performance and the underlying driving forces of the Region not only will help address the 8% of the world's CO₂ emissions but also will provide guidance for the less developed regions of China that want to follow the path to prosperity of this coastal region.

The rest of the paper is organized as follows. The next section provides a literature review on the driving forces of China's carbon emissions. Section 3 and Section 4 respectively present the methods and the data adopted in this study. Section 5 reports and discusses the results of seven underlying driving forces and their relative contributions at both the regional and provincial scale. Section 6 derives the conclusions and the policy implications of this study.

2. Literature review

Previous studies have advanced the knowledge base on the carbon emission characteristics of China in the following aspects:

Download English Version:

<https://daneshyari.com/en/article/8101134>

Download Persian Version:

<https://daneshyari.com/article/8101134>

[Daneshyari.com](https://daneshyari.com)