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# Driving Factors of SO₂ Emissions in 13 Cities, Jiangsu, China

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**Abstract**

With the air pollution getting worse, reducing pollutant emissions has become an important issue in environmental governance nowadays. This paper analyzes the driving factors of SO₂ emissions in Jiangsu Province, China, using Logarithmic Mean Divisia Index (LMDI). The study finds that the end of air pollution control is the main positive drive of SO₂ emission decrease, while energy intensity is the main negative drives; most of the cities have the great potential to improve energy efficiency and reduce SO₂ emissions; governments need to develop specific reduction targets in accordance with the actual situations of different cities.
*Keywords:* Air pollution; Driving factors; Index decomposition analysis; SO₂ emissions

## 1. Introduction

| Nomenclature | | | |
|---|---|---|---|
| Abbreviation | | E | quantity of energy consumption |
| IDA | Index Decomposition Analysis | Y | Gross Regional Product |
| SDA | Structural Decomposition Analysis | R | city |
| LMDI | Logarithmic Mean Divisia Index | △ | addition decomposition |
| Symbols | | D | multiplicative decomposition |
| P | emission quantity | Subscript | |
| F | formation quantity | i | i-th industry |
| C | quantity of raw coal consumption | | |

With the advance of Reform and Opening-up, China's economy has achieved a leap forward development. However, the extensive growth mode has to consume substantial energy resources and cause high intensity of pollution emissions in the long run, which has brought about a series of

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environmental problems. Thereinto, the problem of air pollution is especially serious, of which a typical representation is that the disastrous weather on behalf of haze frequently comes up. To ease the atmospheric pollution, Chinese government has issued a series of environmental protection policies.

Jiangsu province is one of the economically developed provinces in China; but in this area, the air environment protection is also facing a severe challenge. According to 2015 Jiangsu provincial environmental bulletin, in 2014, the air quality of 13 prefecture-level cities fails to reach the corresponding standard. Jiangsu province has taken a series of measures to change the predicament. At the same time, Li et al. [1] indicate that the environmental-economic systems in Southern and northern regions of Jiangsu Province are significantly different, and this phenomenon occurs frequently in the eastern coastal areas of China. So carrying Jiangsu Province as an example can provide conduct for the economic sustainable development of coastal areas.

In recent years, how to control and reduce the emission of air pollutants has become a debatable issue in both domestic and foreign studies. At first these studies need to identify the driving factors of the pollutant emissions. Index Decomposition Analysis (IDA) and Structural Decomposition Analysis (SDA) are the main methods in factors decomposition. Following Ang [2], Logarithmic Mean Divisia Index (LMDI) is the most ideal method. Therefore, we choose this method to study how to control and reduce the emission of air pollutants for Jiangsu.

This paper would identify driving factors of air pollution emissions by temporal and spatial decomposition. What's more, we compare differences at city level, which scholars pay less attention to before.

## 2. Methodology and data

As one of the main air pollutants, $SO_2$ has great harm to human health, acid rain and high aerosol concentration, but few literature have studied it. Therefore, this paper discusses the driving factors of $SO_2$ emissions in Jiangsu and the cities. The research objects are 13 cities in Jiangsu province, China (Figure 1). The period is from 2006 to 2012. The data used are from the *Jiangsu Statistical Yearbook, China City Statistical Yearbook* and the statistical bulletins and yearbooks of each city.



Figure 1 13 sampled cities in Jiangsu, China