

# Study on Carbon Emission and Impact Factor based on LMDI method: the Case of Jiangsu

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Country: China



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## Introduction

- Carbon emission calculation
- Impact factor analysis
- Source of data
- Case studies



### Background



✓ On Sep 22, 2020, in General Debate of the Seventy-fifth United Nations General Assembly, president Xi proposed the vision of Carbon Peak and Carbon Neutrality of China.





✓ in the next five years to come, Jiangsu, as well as other provinces, is still under the continuous pressure of carbon emission reduction.

### **Current research**



#### Challenges

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Online database

#### 江苏省"十四五"应对气候变化规划

(征求意见稿)





did not count the carbon emission from the electricity received from other provinces



#### these two factors cannot be measured simultaneously



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#### Calculation using the energy balance table



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### **Extended Kaya equation**

Classic Kaya equation:





### LMDI method

The difference of the carbon emission between the year t and the base year:

The impact from the population:

$$\begin{split} \Delta c_t &= \sum_{i \in I} \sum_{j \in J} c_{i,j,t} - c_{i,j,0} \\ &= \sum_{i \in I} \sum_{j \in J} \Delta c_{i,j,t}^p + \Delta c_{i,j,t}^A + \Delta c_{i,j,t}^B + \Delta c_{i,j,t}^C + \Delta c_{i,j,t}^D + \Delta c_{i,j,t}^\alpha \\ \Delta c_t^p &= \sum_{i \in I} \sum_{j \in J} \Delta c_{i,j,t}^p \\ &= \sum_{i \in I} \sum_{j \in J} \frac{(c_{i,j,t} - c_{i,j,0})(\ln p_t - \ln p_0)}{\ln c_{i,j,t} - \ln c_{i,j,0}} \end{split}$$

Other factors can be decomposed similarly

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#### Source of data

Data	Source
population, GDP	Jiangsu statistical yearbook
energy consumption	China energy statistical yearbook
carbon emission factor	the guideline of the provincial greenhouse gas inventories



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# General trend of the carbon emission in Jiangsu



#### Fig 1 Carbon emission structure in Jiangsu

- 2010-2019, carbon emission grows steadily by 27.28%.
- Coal is always the dominant source of carbon emission. However, its share is decreasing from 81.13% in 2010 to 67.39% in 2019.
- the carbon emission from outside electricity is growing rapidly by 220.90% in ten years.



Fig 2 Carbon emission intensity in typical provinces and decoupling index in Jiangsu

- Though the carbon emission quantity is increasing in recent years, the its intensity is decreasing smoothly
- the decoupling index remains between 0-0.6, which indicates that the economy and carbon emission are weakly de-linked.

### **Carbon emission structure**



Fig 3 Carbon emission structure of energy sector in Jiangsu



industrial sector in Jiangsu

- the electricity generation and heat supply sectors mainly rely on coal, but its carbon emission decreases by 18.35% and 3.88% in recent ten years.
- The carbon emissions from coal and electricity of the industrial sector are 41.92% and 41.49%, respectively. the proportion of gas is increasing.
- the carbon emission from petroleum products of the transportation sector is 83.81%. the shares of gas and electricity grow slightly from 0.57% and 5.33% in 2010 to 6.22% and 9.94% in 2019.
- The carbon emission from the electricity is the highest in the building sector. the carbon emissions from coal, petroleum product, and heat decrease from 2.52%, 7.47%, and 1.73% in 2010 to 0.05%, 2.08, and 0.22%, respectively.



Fig 5 Carbon emission structure of the transportation sector in Jiangsu



### Impact factor analysis



Fig 7 impacts of different factors on the carbon emission in Jiangsu



carbon emission of the industrial

- the impact of population on carbon emission remains in a reasonable range.
- Economy growth is the main driving force, especially for industrial and building sectors.
- The contribution of energy structure is negative in general, but positive in some years.
- The impact of industrial structure is negative. it was effective in the reduction of carbon emission by optimizing the industrial structure in the past years.
- The contribution of energy consumption intensity is negative, especially in the industrial sectors and building sectors.



Fig 9 impacts of different factors on the carbon emission of the transportation sector



Fig 10 impacts of different factors on the carbon emission of the building

### Thank you