



Guangdong ETS - Impact Assessment and policy recommendations

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– the market building processes

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Macroeconomic Impact Analysis of GD ETS

Carbon Trading Mechanism has Become an Important Tool for Governments to Reduce Carbon Emission



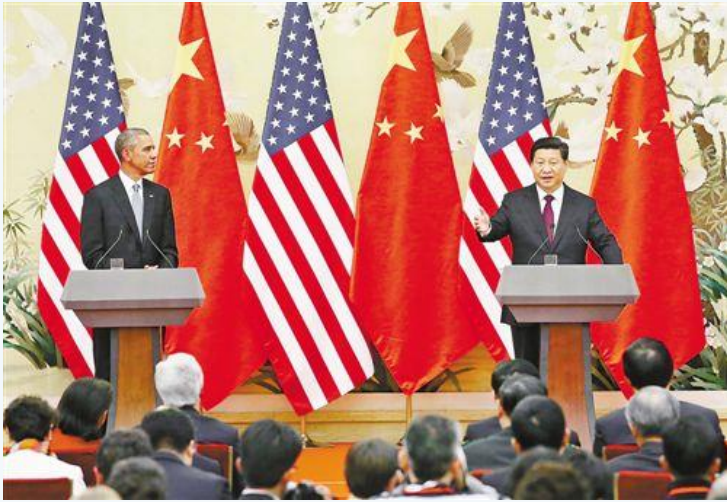
Chinese Government Carbon Trading Pilot Deployment and Process

In October 29, 2011, the national development and Reform Commission issued a document <notice about carrying out the carbon emissions trading pilot work>, which approved seven cities as pilots regions to carry out the carbon emissions trading system, including: Beijing, Tianjin, Shanghai, Chongqing, Hubei, Guangdong, Shenzhen.

Seven China's pilot ETS launch



The step of National carbon market



Nov, 12, APEC , publish the Sino-US joint statement on climate change , announce the action after 2020.

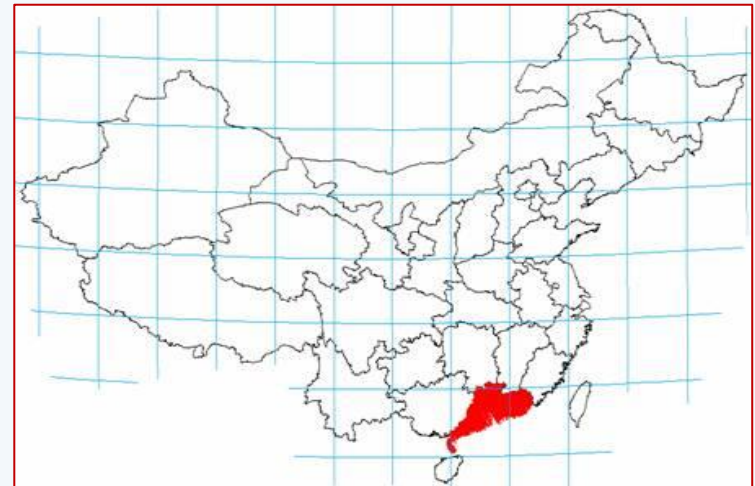
US promise to reduce 25% before 2025

China promise to peak at 2030 and non fossil to 20%.

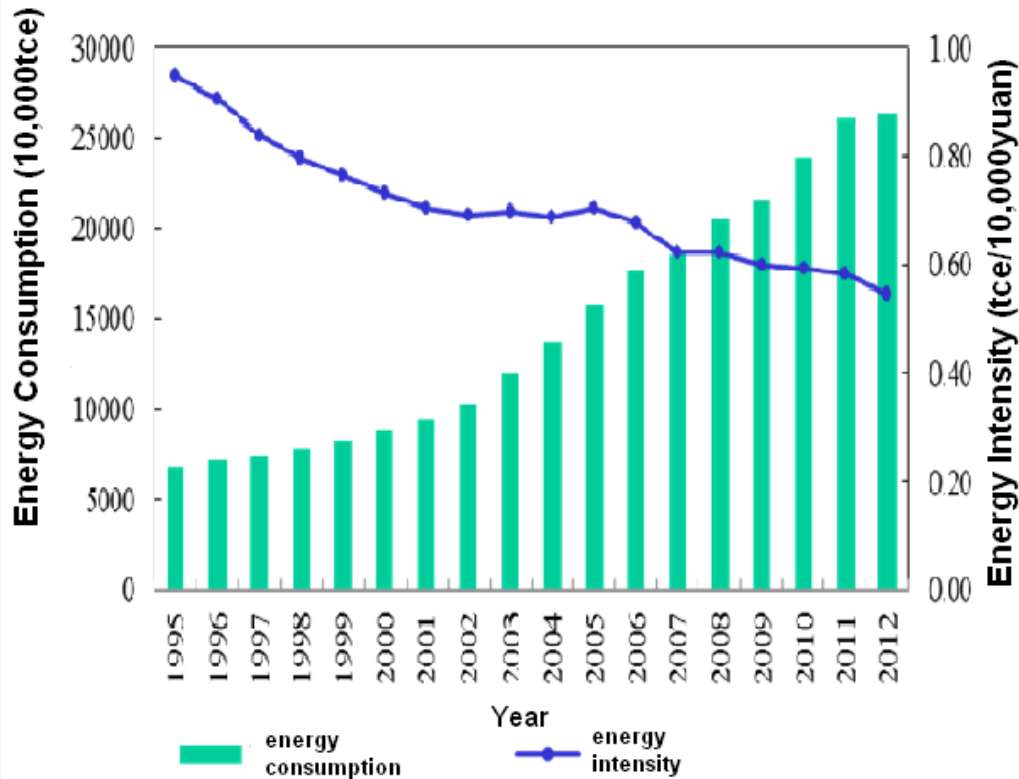
NDRC : National ETS market is considered as the key reform, it will be launched from 13th Five-Year-Plan (2016-2020)

Basic Economic and Social Development Situation

Guangdong in 2007	Value	Share in China
Population (Million persons)	94.49	7.2%
Energy (PJ) and emissions (Million ton)		
Coal	2670.1	5.0%
Petrol oil	1980.2	14.9%
Gas	178.2	6.5%
Electricity (TWh)	3394.1	10.4%
CO ₂	414.7	7.02%
Economic indicators (billion USD)		
GDP	405.3	11.6%
Per capita GDP	4289	1.61
Textile	72.2	12.3%
Paper and pulp	18.9	16.2%
Metal products	47.3	20.1%
Machinery	175.4	13.4%
Electronic equipment	207.2	37.8%



Growing energy consumption with declining energy intensity

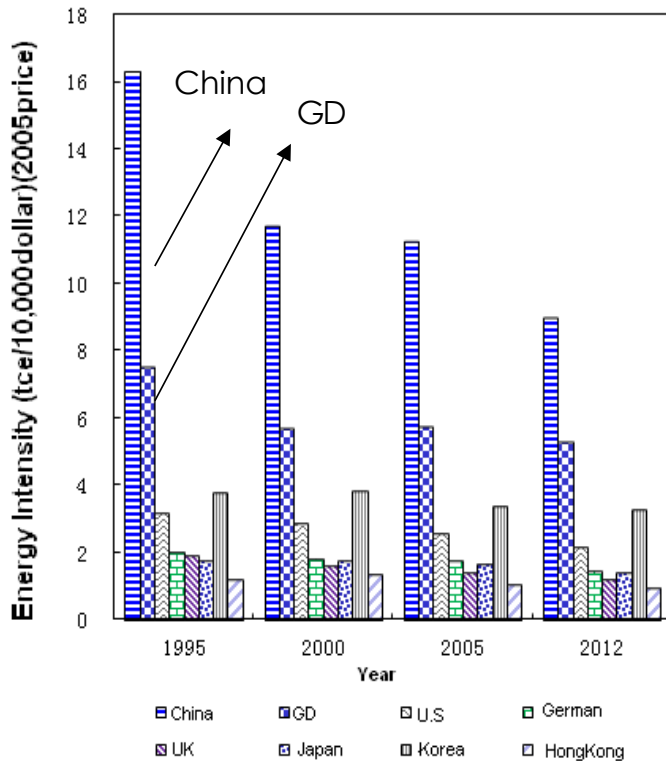


With continued economic growth and urbanization, Guangdong's energy consumption will grow year by year. Total energy consumption of some high energy-consuming industries will grow rapidly.

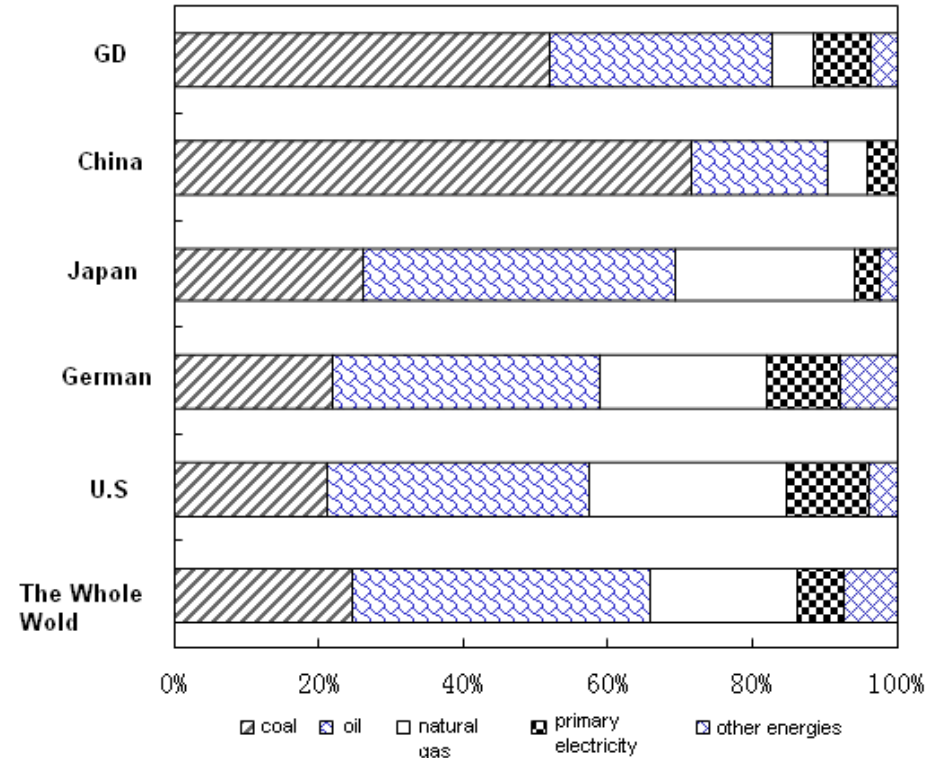
However, energy intensity will decline year by year with the optimization of industrial structure and implementing of energy-saving measures.

The energy saving development situation of GD – comparing internationally

GD's energy intensity is lower than the average level of China, and there is still a gap between world.



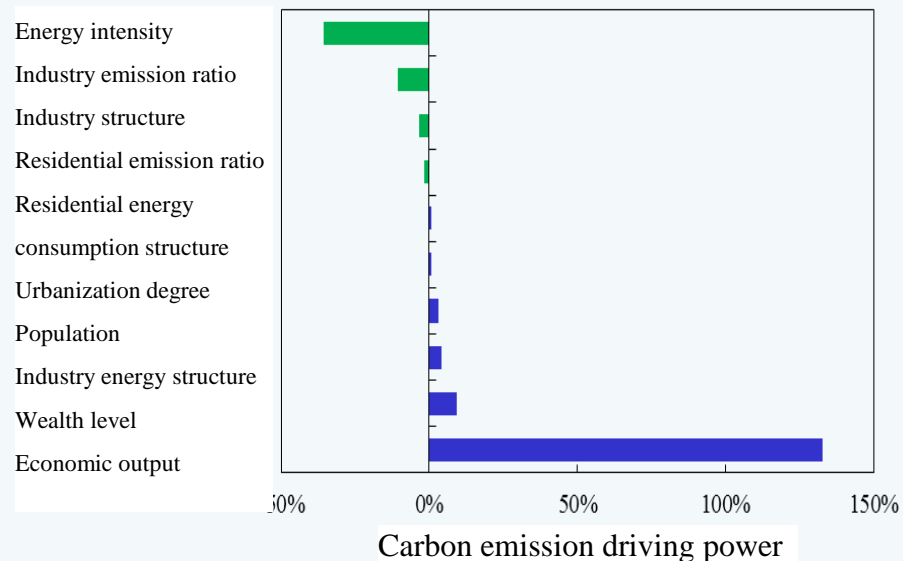
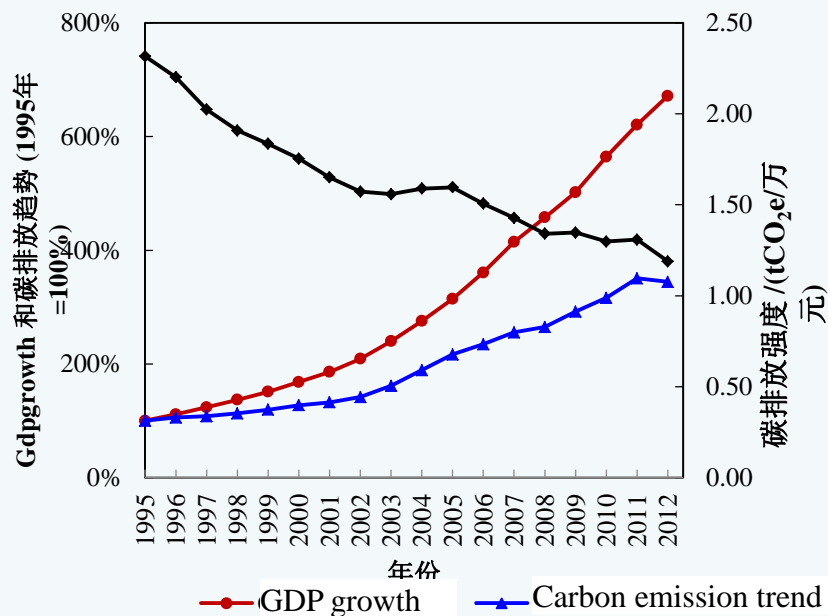
Energy Intensity
– comparing with other countries



Energy Structure in 2012
- comparing with other countries

Driving Factors and Trend of Guangdong Carbon Emission

As the first major economic province, Guangdong's GDP and carbon emissions showed an upward trend, and the speed of GDP growth faster than that of carbon emission, emission intensity is decreasing year by year. Guangdong's carbon emission intensity had dropped from 2.32 in 1995 to 1.19 tCO₂e/10,000 yuan in 2012, with average annual decline of 4%. The result of carbon emission driving force factor decomposition showed that the main driving factor of carbon emission increment is from economic output. With the sustained economic growth of Guangdong, carbon emissions will rise further, but the speed will slow down gradually.



The Goal of Energy-saving and Emission Reduction During the 12th Five Year Plan

Factors	Reduction target during the 11 th five year plan		Reduction target during the 12 th five year plan	
	National	Guangdong	National	Guangdong
Target of energy consumption per unit GDP decrease	20%	16%	16%	18%
Target of carbon emission reduction per unit GDP	19.1%	-	17%	19.5%
The proportion of new and renewable energy in primary energy consumption	10%		11.4%	
Forest coverage percentage	20%		21.66%	

<planning of energy-saving and carbon emission reduction for the 12th five years>

Form the mechanism of reversal pressure to promote the transformation of economic development mode, establish an effective incentive and control mechanism to reduce the GHGs emission and enhance energy using efficient. Marketing mechanism will be an sound tool.

Design and operation of Guangdong carbon emissions trading mechanism

- **Local regulations**

"Guangdong Province carbon emissions trading pilot work plan" (September 2012)

Decree 197th, announced the "Guangdong Province trial carbon emissions management measures"(January 2014)

- **CAP**

Guangdong's total quotas of the cap was about **388 million ton-CO₂** in 2013

- **Coverage**

Four energy intensive sectors: **cement, electric power, steel and petrochemical** have been incorporated into ETS, the average annual emission of four industries accounted for more than 50% of the total carbon emissions of Guangdong.

- **Allocation**

Baseline method was employed by electric power and cement industries, the rest of the industry uses the historical method

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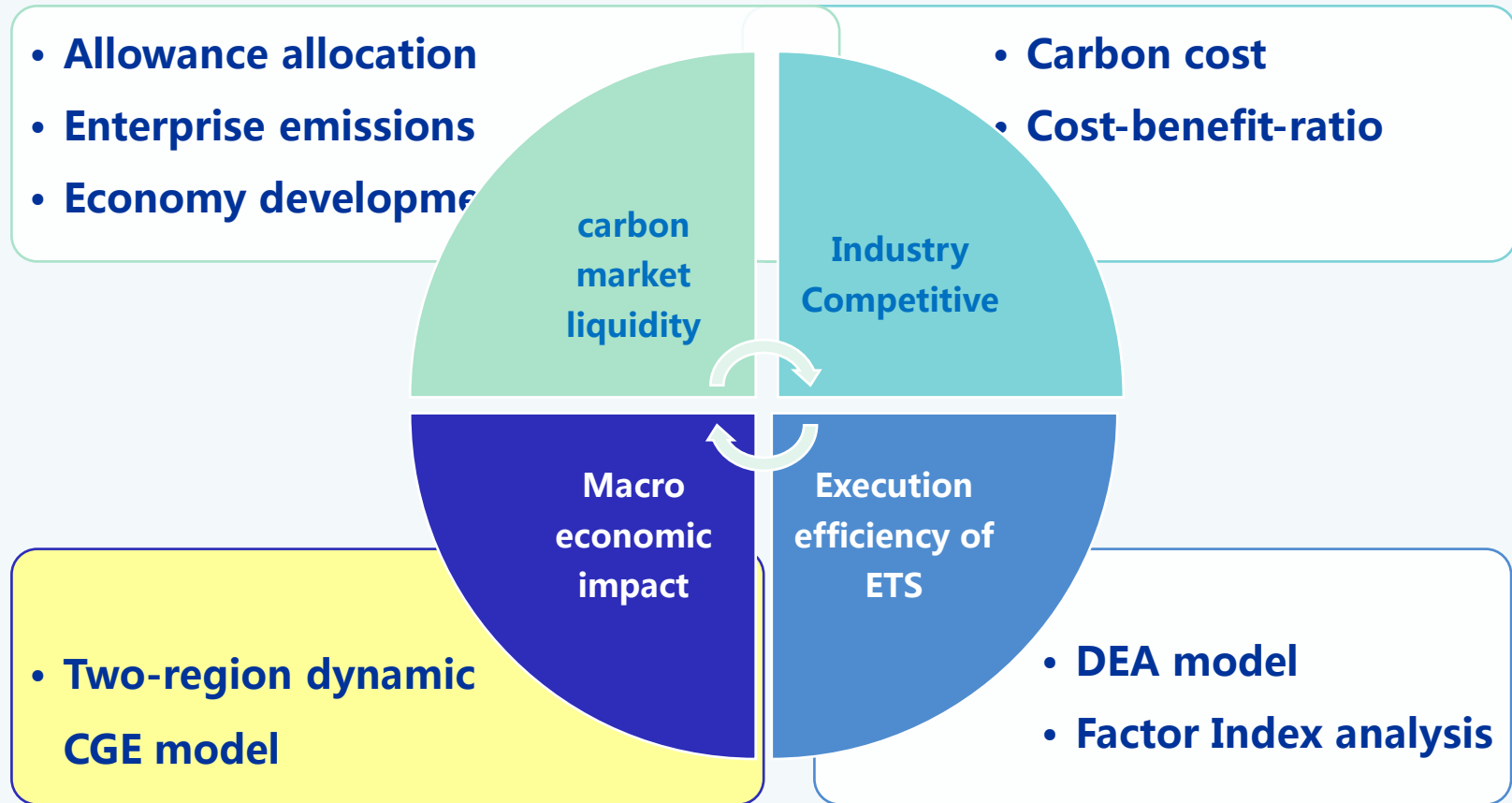
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二、 Evaluation Methods of ETS

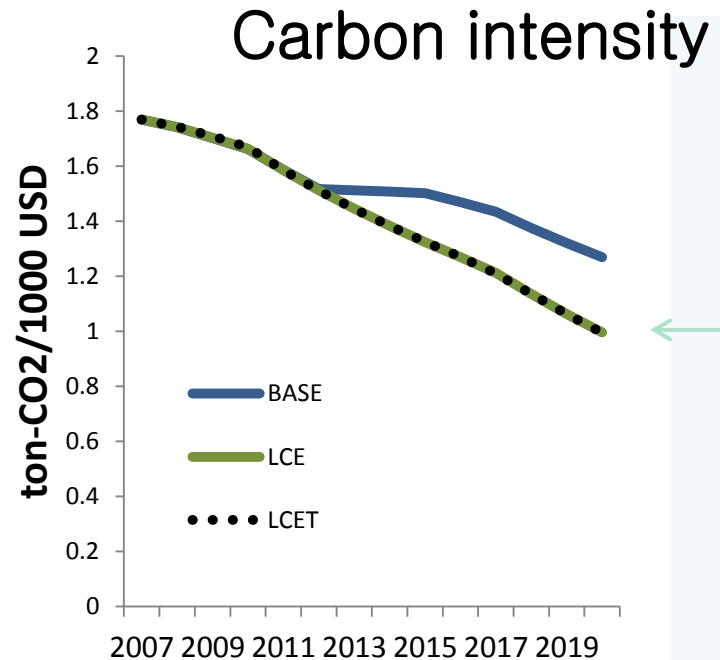
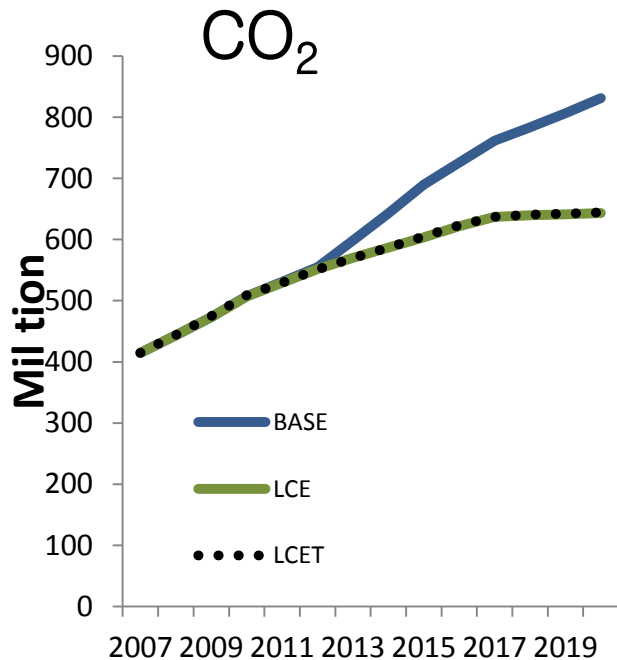


三、Macro economic impact analysis: model structure

- This work was published in:
 - Wang, P., H.-c. Dai, S.-y. Ren, D.-q. Zhao and T. Masui (2015). "Achieving Copenhagen target through carbon emission trading: Economic impacts assessment in Guangdong Province of China." *Energy* 79(0): 212-227
- CGE model based on new classical economics general equilibrium theory
- Dynamic-recursive model, including two region of Guangdong and the rest of China and 33 sectors (7 energy sector).

Scenario	Emission trading	Emission constraint
Base	None	No carbon cap.
LCE	None	Carbon intensity reduces by 40% over 2010-20;
LCET	Yes	Annual growth rate of carbon between 2013-15: Power sector 0.5% Oil refinery 0.8%, cement 0.5%, iron and steel 0.5%; 2016-20: Power 0.1%, other three sectors 0.2%.

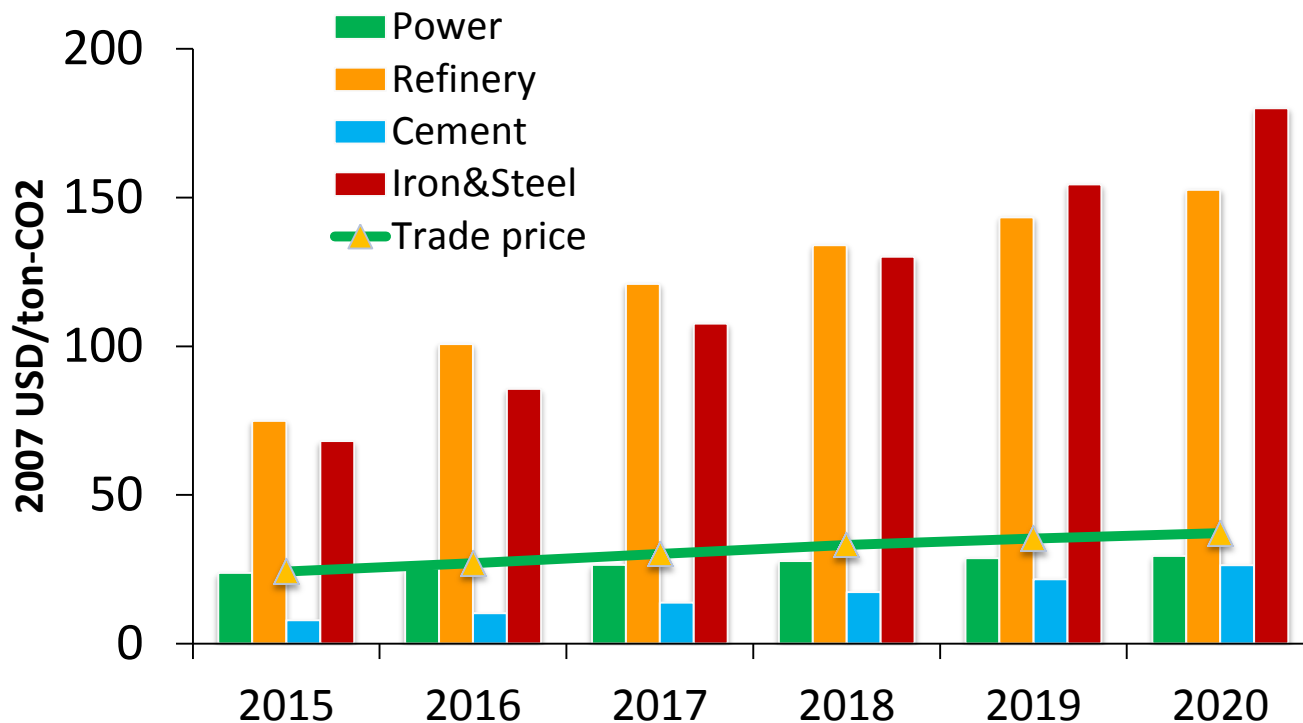
Carbon emissions and intensity change



➤ From 2007 to 2020 in the Base scenario: CO₂ emissions will increase by more than 2 times, and its share in China will increase from 7.0% to 7.4%.

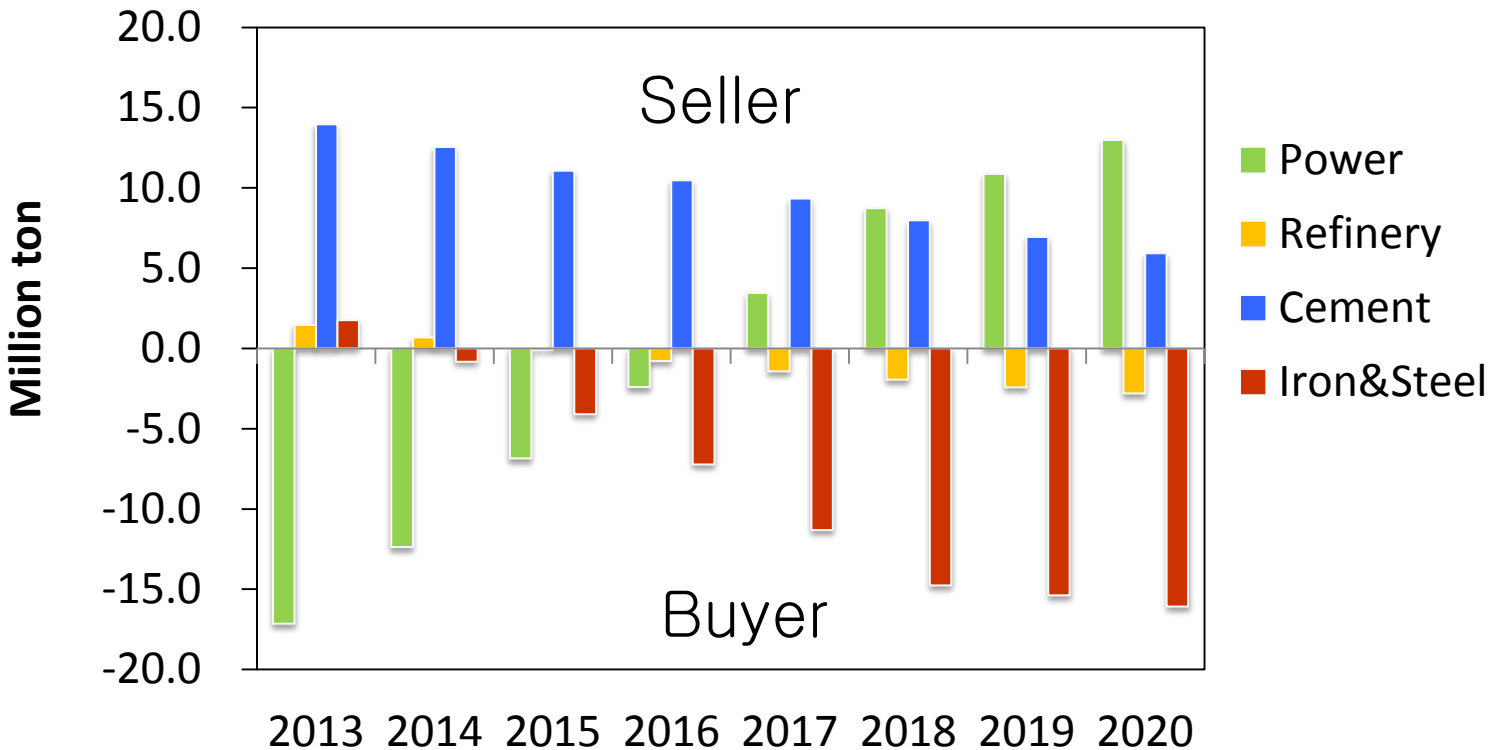
➤ Carbon caps are imposed on the four sectors in the LCE scenarios, the carbon intensity will decrease **50%** from 2005 to 2020, more than the Copenhagen commitment (40-45%)

Carbon abatement cost



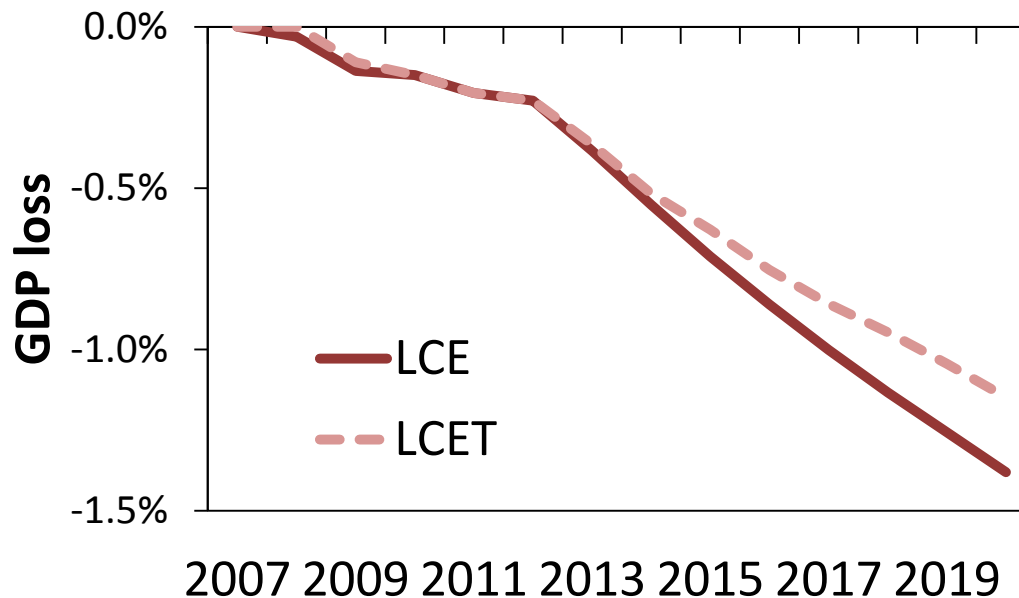
- Carbon shadow prices of sectors in 2020 are: **180USD (iron and steel)**, **152 USD (refinery)** and **26 USD (cement)** and **18 USD (power)** per ton-CO₂
- The level of the mitigation cost is determined by many factors. One of the most important one is reduction rate from BASE level.

Emission trade: carbon price and trade volume



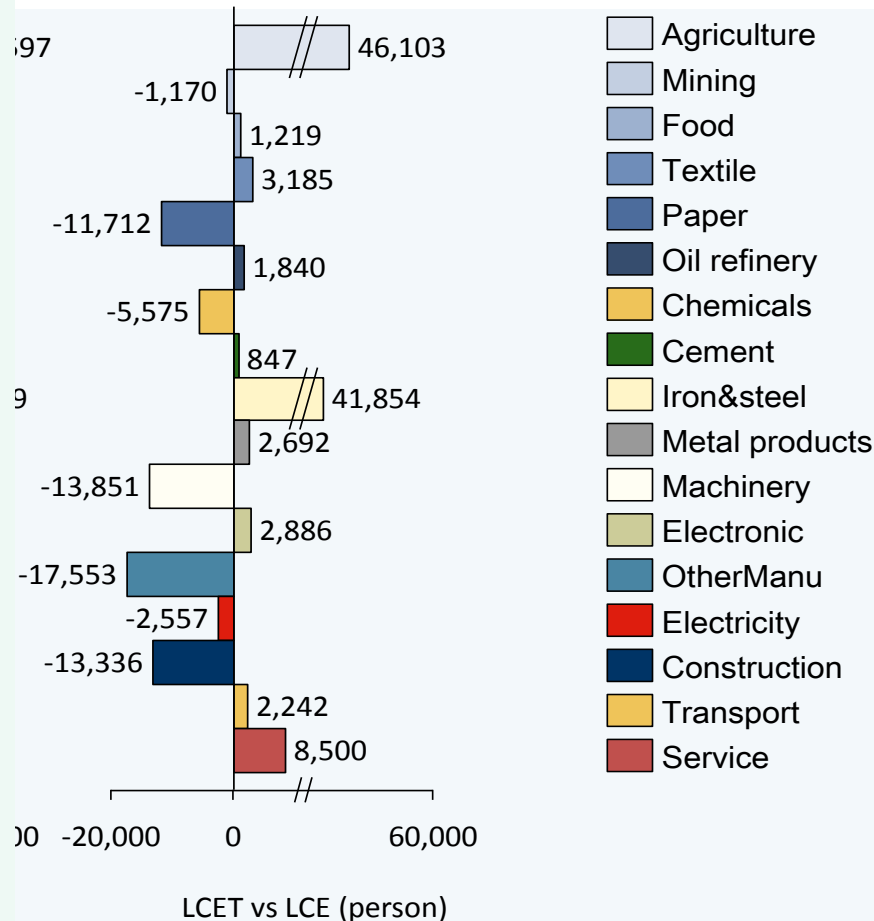
- As the carbon abatement cost is different, emissions trading takes place among sectors
- In 2020, the traded volume is **27 Mt** and the equilibrium trading price is **37 USD/ton** CO₂, resulting in the scale of the carbon market being **1.02 billion USD**.

Impacts on GDP



- The aggregated GDP loss in 2020 is **1.38%** in LCE scenario, but reduced to **1.15%** in LCET.
- The policy makers need to think seriously on how to reduce the GDP loss by more appropriate design of climate policy based on market based instruments.

Analysis results: ETS on the employment

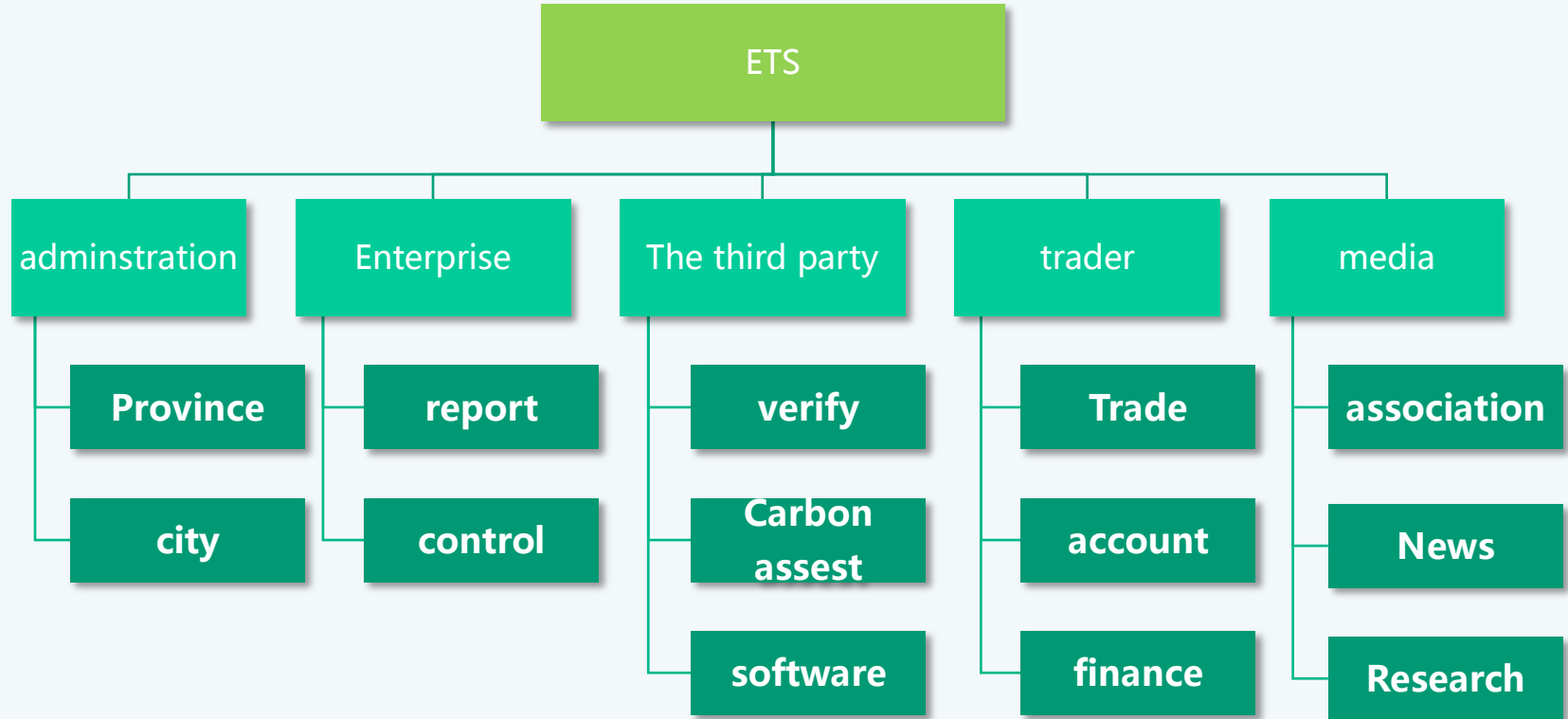


ETS increase **45614**

Employment increase :
 Agriculture, Food,
 textile,
 Cement, Iron,
 Electronic ,service
Total increase
37,000-45,000 jobs

The quantity of employment in all sector change with and without ETS

Estimate : ETS on the service



Jobs : ~20,000 person

Conclusions

1. In 2020, the carbon price of **power** sector is the lowest, followed by **cement** sector, whereas that of **refinery** and **iron and steel** sectors is higher.
2. During 2015-2020 , controlling emissions will cause GDP loss **0.8%-1.4%**. ETS will reduce GDP loss → ETS policy is economically efficient.
3. Enlarge the sector coverage of ETS will reduce the GDP loss and decrease the carbon price.
4. Through CGE model simulation, ETS would bring **40,000 jobs** compared with carbon constraint policy. It' s important to pay attention to the jobless of construction, mechanics and paper sectors.

Future work on modeling

- ✓Further simulate the carbon auction revenue return back style
- ✓Develop the Enduse model to link with CGE to discuss peak of Guangdong
- ✓Using model to research of air pollutant emission control of Guangdong



Thank you very much !

