

# **Biochar Stoves as a Solution to Rural Energy Consumption Challenges**

**—a background research for policy makers**

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# Content

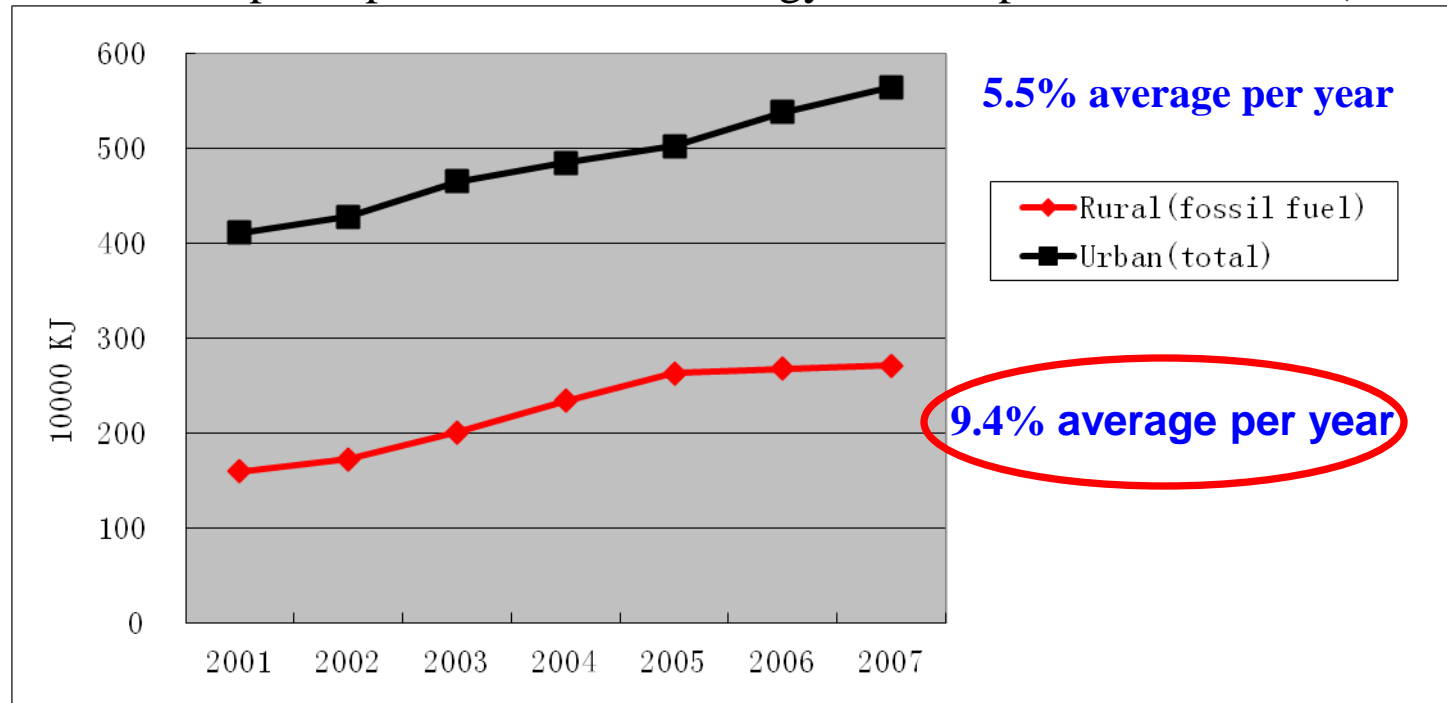
- The challenges from Rural Residential Energy Consumption according to GEI's Rural Energy Program research;
- Why and how biochar is a solution to the challenges;
- How to make biochar stoves effective?
- Policy suggestions

# 1. The challenges

- 1.1 Rural Residential Energy Consumption (RREC)
- 1.2 CO<sub>2</sub> emissions from RREC
- 1.3 Projects of CO<sub>2</sub> emissions by 2020

# 1.1.1 the high growth speed of RREC

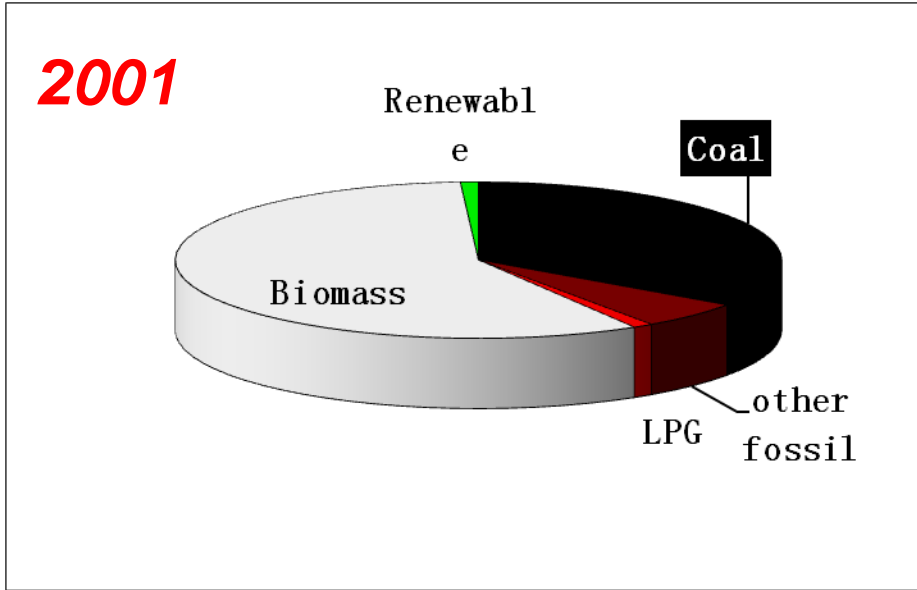
Rural and Urban per capita Residential Energy Consumption in China (Unit:10<sup>4</sup> KJ)



**Increase rate:** rural fossil energy consumption grows faster compared to urban by 4.4% per year;

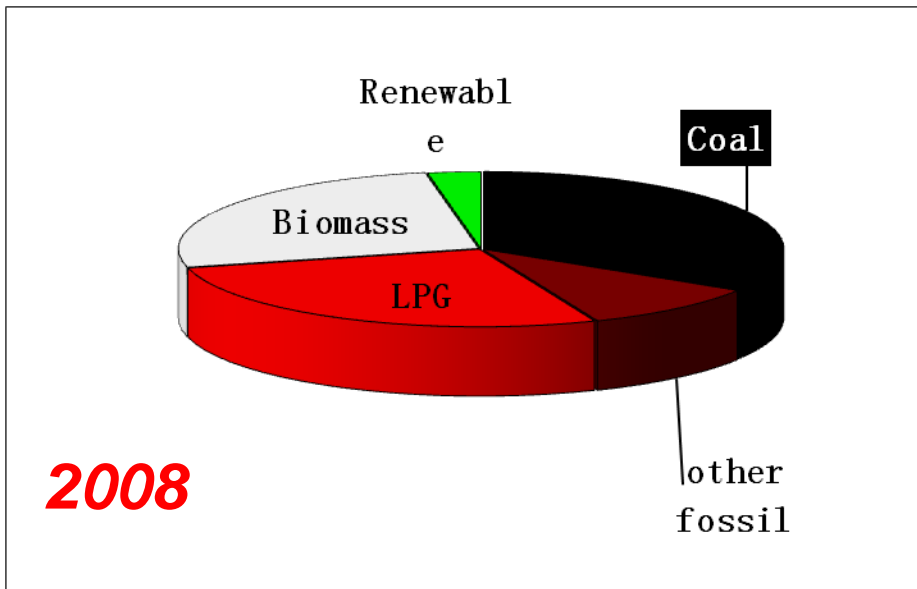
Sources :calculated based on *China Energy Statistical Yearbook 2009* , *China Statistical Year Book 2009*, unpublished manuscript from the Department of Science and Technology Education under the Chinese Ministry of Agriculture, entitled: “National Statistical Atlas of Rural Renewable Energy, 2001-2008.”

# 1.1.2 RREC's structure transformed to fossil fuel dominant



2001 non fossil	59%
2001 fossil	41%

*Rural residential energy consumption structure transformed to **fossil fuel dominant***



2008 non fossil	29%
2008 fossil	71%

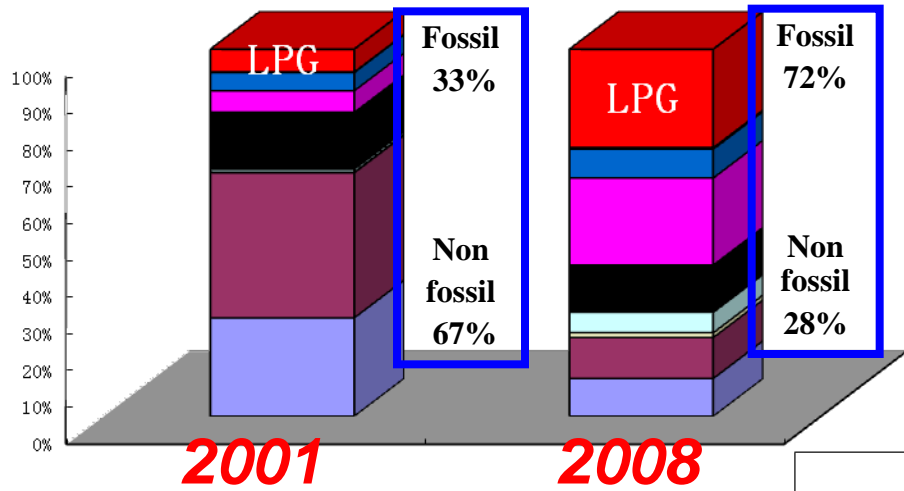
Non-fossil=Biomass + Renewable

Biomass=firewood + straw

Renewable= biogas + solar

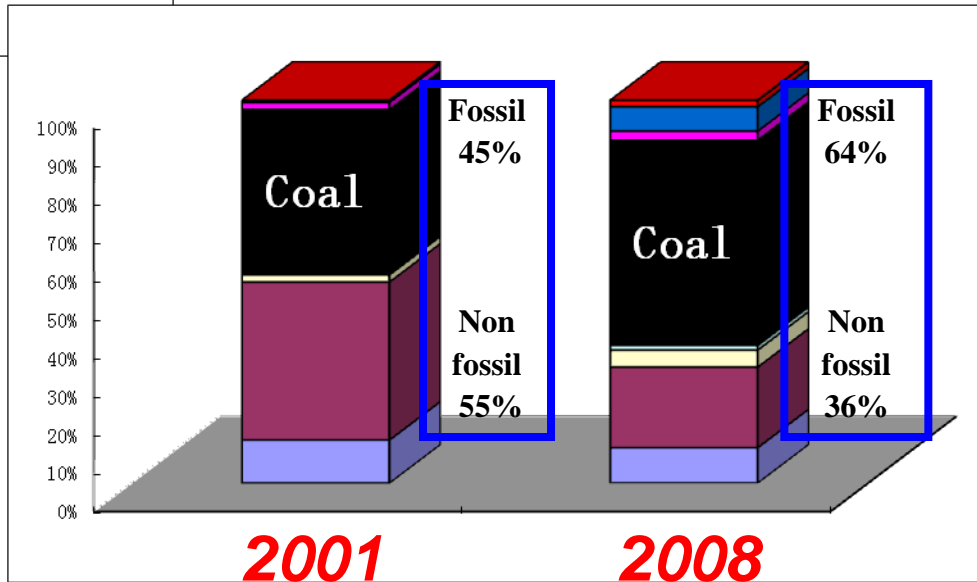
Other fossil=oil + electricity

# 1.1.3 Developed rural areas shifted to LPG dominant Less developed rural areas shifted to Coal dominant



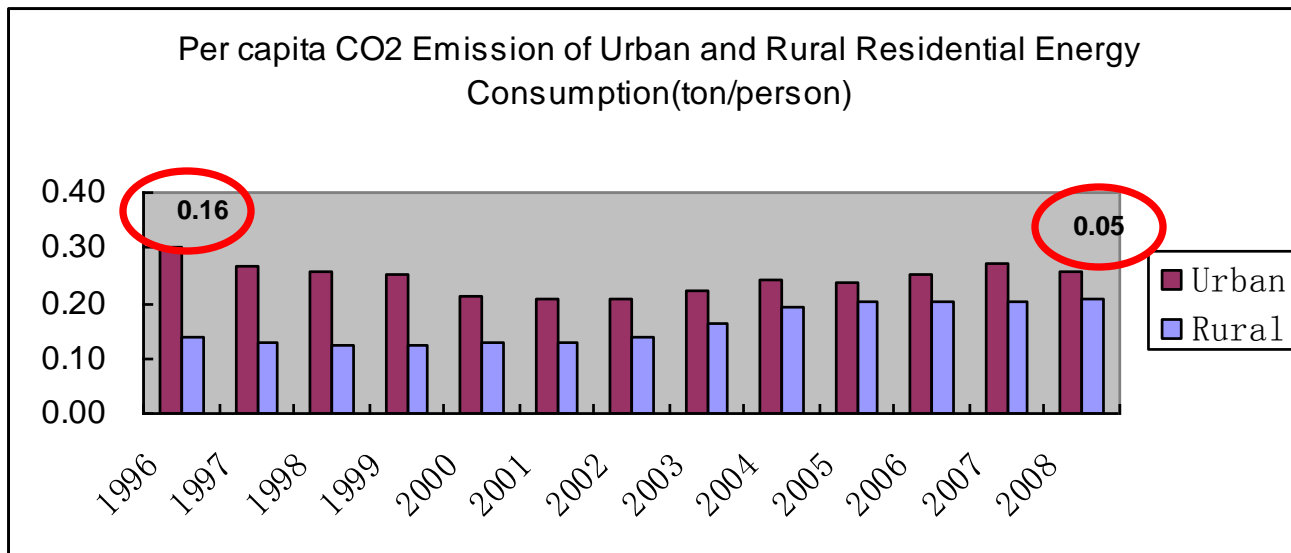
Rural Zhejiang

Rural Yunnan

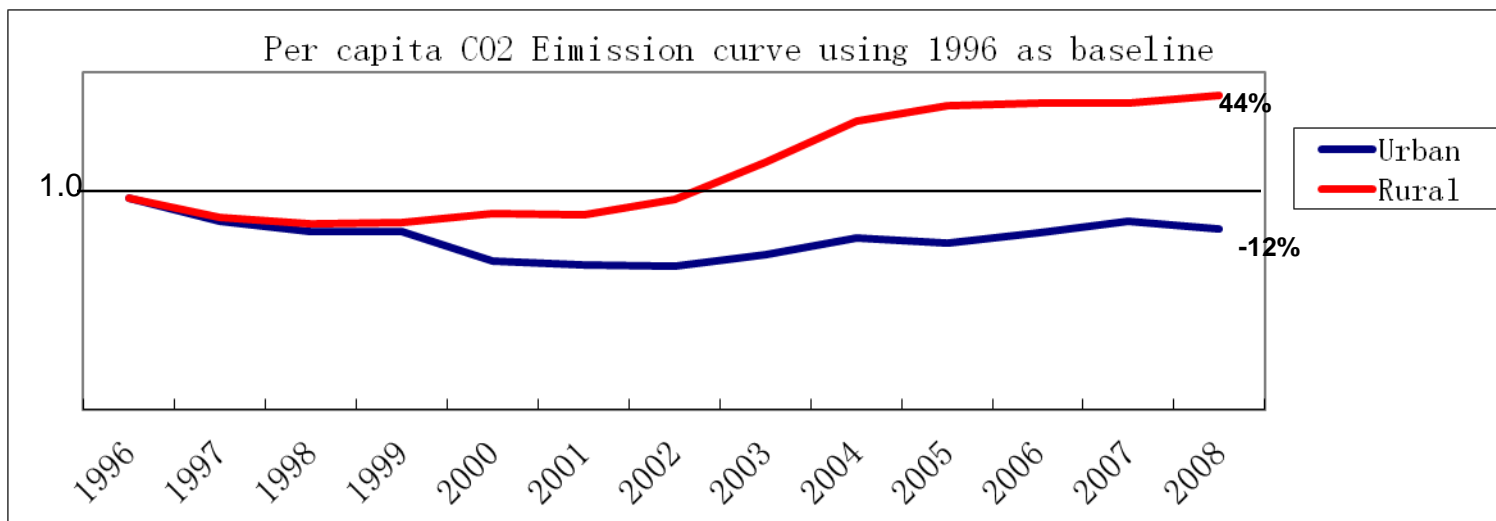


Sources :calculated based on unpublished manuscript from the Department of Science and Technology Education under the Chinese Ministry of Agriculture, entitled: "National Statistical Atlas of Rural Renewable Energy, 2001-2008."

## 1.2.1 CO<sub>2</sub> emissions from RREC



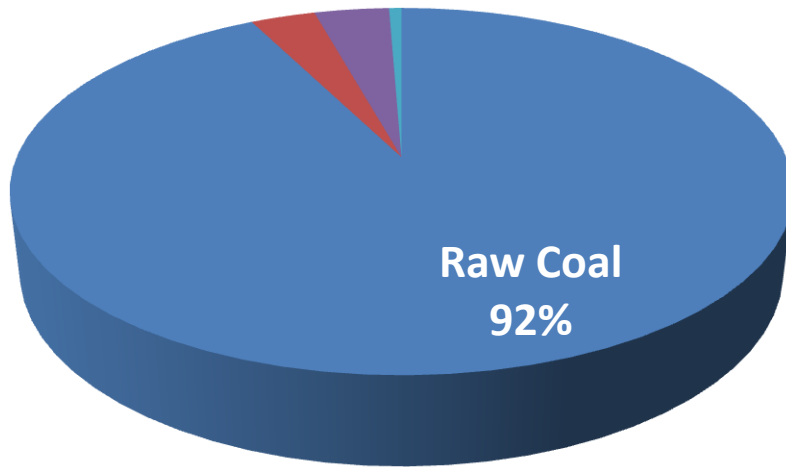
**\*Rural per capita CO<sub>2</sub> emission is keeping increasing compared to urban, fast**



Sources :calculated based on *China Energy Statistical Yearbook 2009* , *China Statistical Year Book 2009*, unpublished manuscript from the Department of Science and Technology Education under the Chinese Ministry of Agriculture, entitled: "National Statistical Atlas of Rural Renewable Energy, 2001-2008."

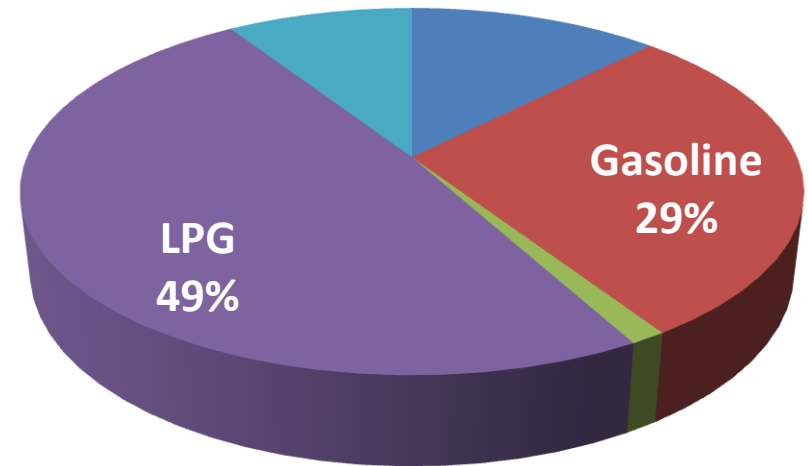
## 1.2.2—Top 2 CO<sub>2</sub> emitters in 2008

**Rural Beijing**



**The future of North rural China**  
huge heating demands, coal  
dominant

**Rural Shanghai**



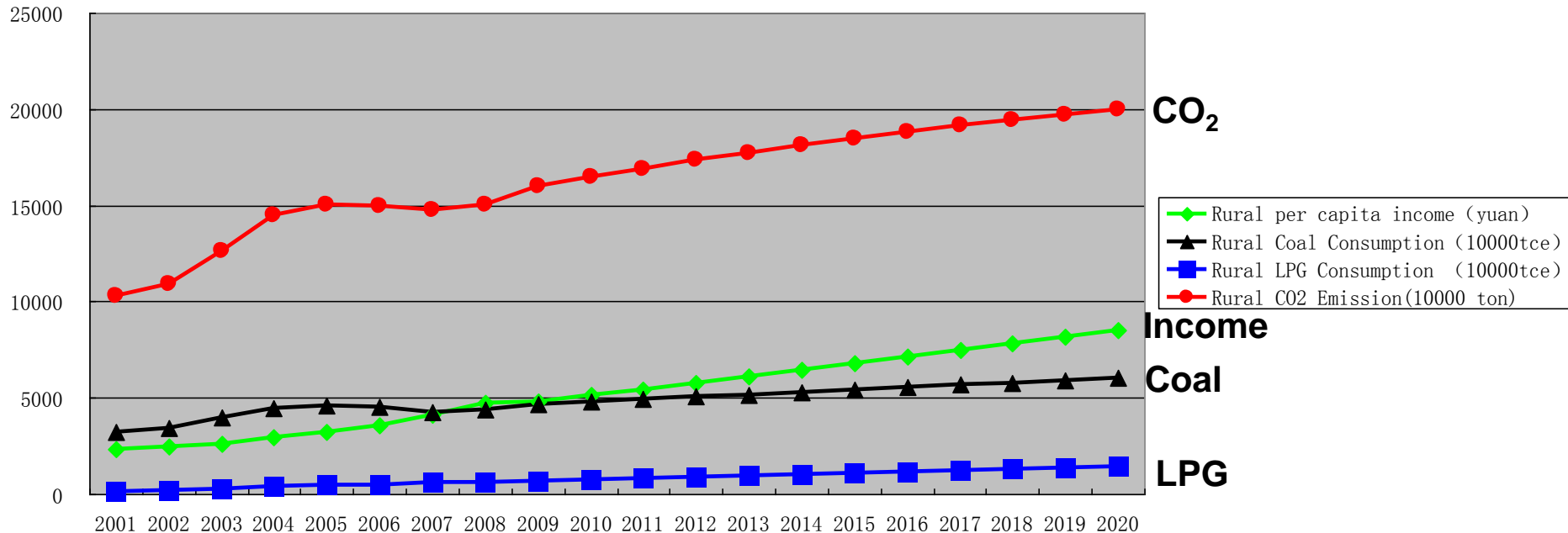
**The future of South rural China**  
improved cooking demands, LPG  
dominant

Huge CO<sub>2</sub> emission=huge fossil fuel consumption  
=huge demands\*ability to buy



# 1.3 Projections of rural CO<sub>2</sub> emissions & fossil fuel consumption by 2020

Rural CO<sub>2</sub> Emission and major fossil fuel consumption projection



**•In 2020, all rural areas in China reach the income level of Beijing in 2006 (8000 yuan or so)**

**•From 2010-2020, Rural China will consume**

**835,106,850 tons coal (net coal importer since 2007)**

**69,324,904 tons LPG (overall available supply in 2008: 21 million tons)**

**•Rural China will emit 2,022,494,000 tons CO<sub>2</sub>**

## 2.Solutions?

Ensuring  
Energy Security

Providing  
Clean Energy

Reducing CO<sub>2</sub>  
Emissions

## Why biochar stoves?

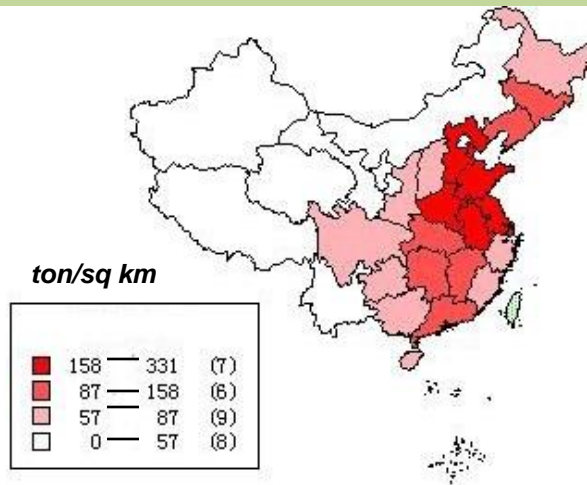
Cooking/heating

Improved combustion

Charcoal storage carbon

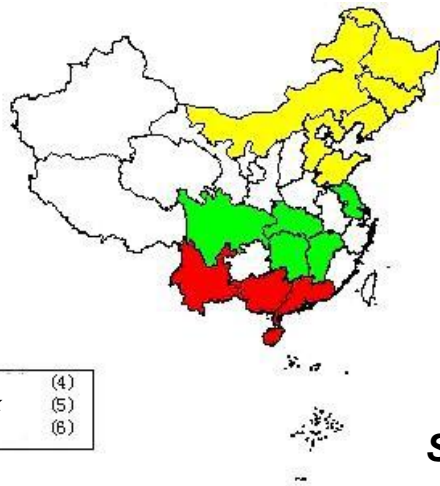
# 2.1 China is rich in biomass resources

## Crop Straws

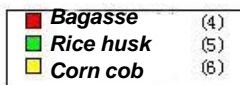


Year	Total (billion tons)	Energy potential (billion tons)
2005	0.61	0.3
2010	0.78	0.4
2015	0.9	0.45

## Agriculture Products Processing Waste



**Year 2005: 0.1 billion tones in total**



Source: MOA, Plan of Agricultural Biomass Industry (2007-2015)

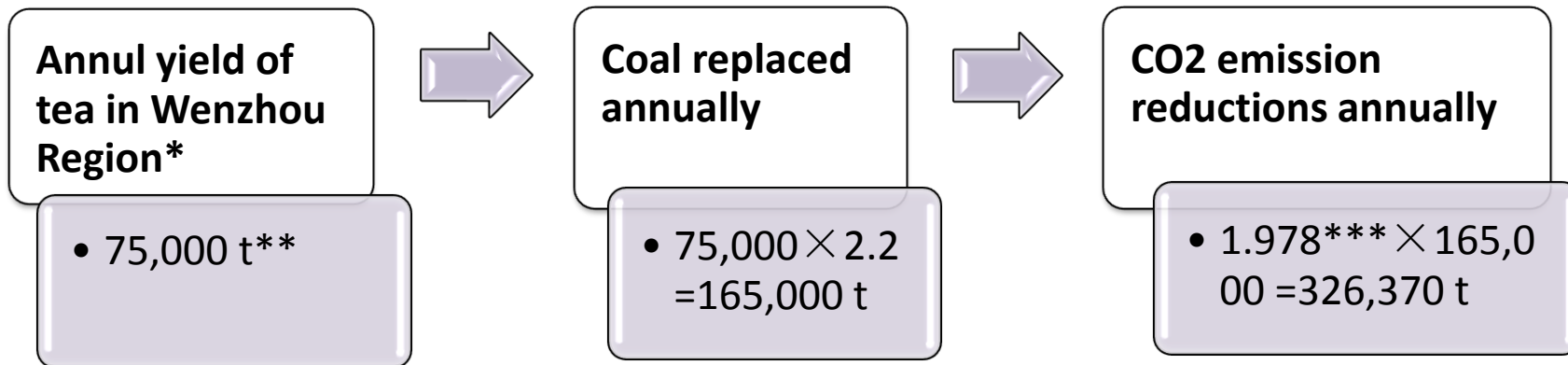
## 2.2 Biochar is cost-saving

### Cost analysis of energy resources for tea drying equipments

Types	Consumption quantity per tons of tea (output)	Price	Drying cost per tons of tea (Yuan/t)	By-products
Coal	2.20 t	1050 Yuan/t	2310	N.A.
Electricity	4000 kWh	0.82 Yuan/kWh	3280	N.A.
Biomass	1.46 t	1000 Yuan/t	1460	Biochar(146 kg)

Source: data is calculated based on on-site survey in Hangzhou

## 2. 3 biochar stoves reduces CO2 emission



\*Including Wenzhou of Zhejiang, Fuding, Fu'an and Shouning of Fujian

\*\* data is from local Bureau of Reclamation or Bureau of Economic Crops

\*\*\* emission factor of coal  $\times$  its calorific value

### 3. How to make biochar stoves effective?

- Improving biochar technology
- Creating policy support mechanism
- Establishing financial mechanism

## 4. Policy suggestions

- Refer to the subsidizing policy on compressed biomass briquette
- Measure by production of charcoal
- Application conditions and procedures transparency
- Evaluation program ensure quality



***Thanks***

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