

復旦大學



# The Depth Distribution of Chinese Coal Resource

Kexi Pan

**School of Social Development and Public Policy**

**Fudan University**

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# Introduction

- China is relatively abundant of coal, at the time-being, the depth of coal exploitation is about 400~500m, (in some special cases, it is 600m).
- Alongside with the increase of depth, exploitation cost, safety, etc. are very serious problems.
- Generally speaking, the coal seams with depth more than 1000~1500m are not suitable for exploitation. Because of the difference of absorb ability of  $\text{CO}_2$  and  $\text{CH}_4$ , injection of  $\text{CO}_2$  to replace  $\text{CH}_4$  is a win-win strategy.
- From aspect of  $\text{CO}_2$  sequestration, detailed survey, study and analysis of the deep unminable coal seams will be of significant importance.



# Chinese Coal Resource

**Total Resource Amount**  
**5569.7 billion tons**

**Reserves Proved up**  
**1017.6 billion tons**

**Possessed Reserves**  
**1003.2 billion tons**

**Exploitable Reserves**  
**114.5 billion tons**

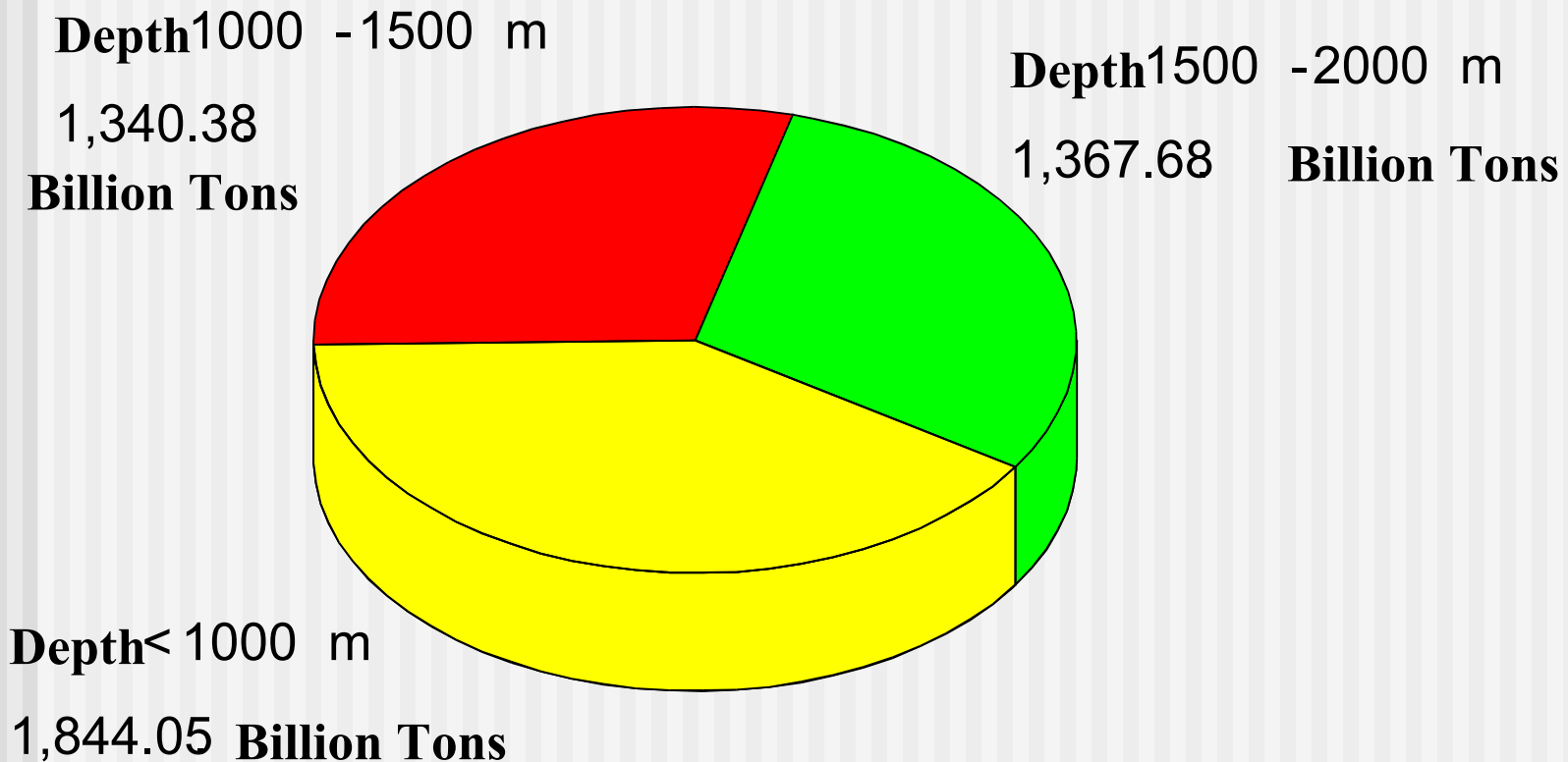
**Forecasted Resource**

**4552.1 billion tons**





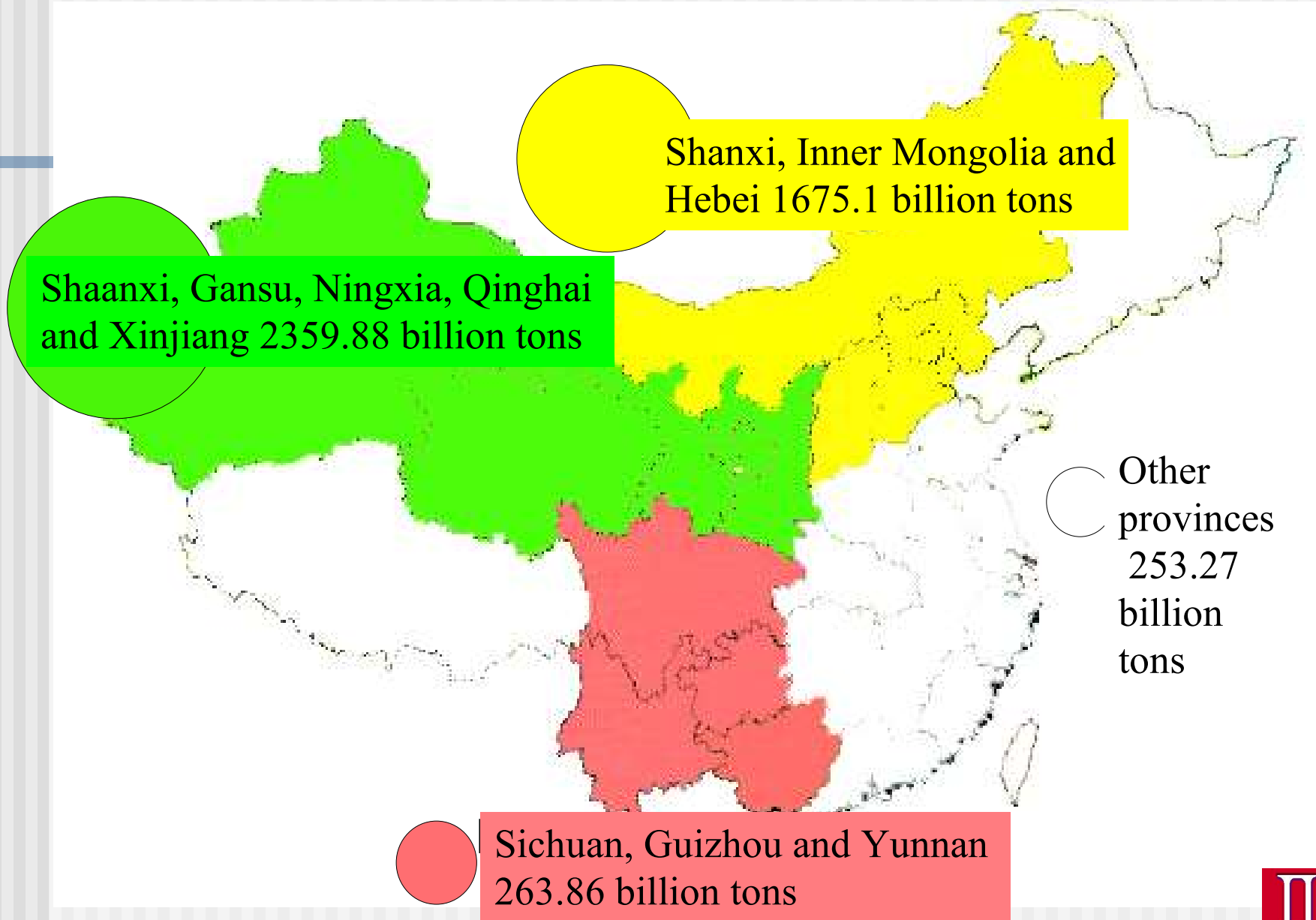
# The Depth Distribution of Chinese Coal Resource



Chinese Forecasted Coal Reserves Distribution by Depth(4,552.1 Billion Tons )



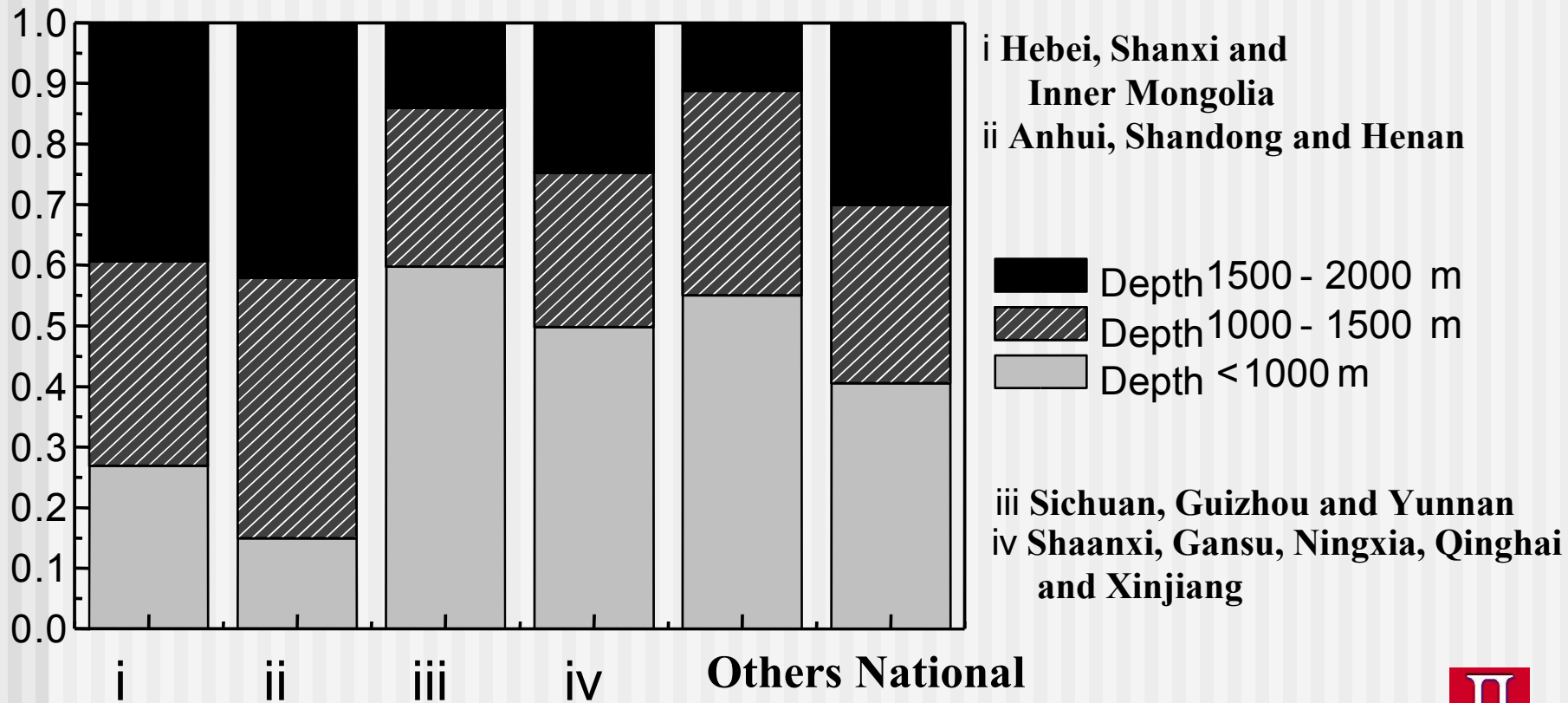
# Chinese Forecasted Coal Reserves





# Chinese Forecasted Coal Reserves Distribution by Depth

## Chinese Forecasted Coal Reserves Distribution by Depth



## Chinese Forecasted Coal Reserves (Depth<1000m)

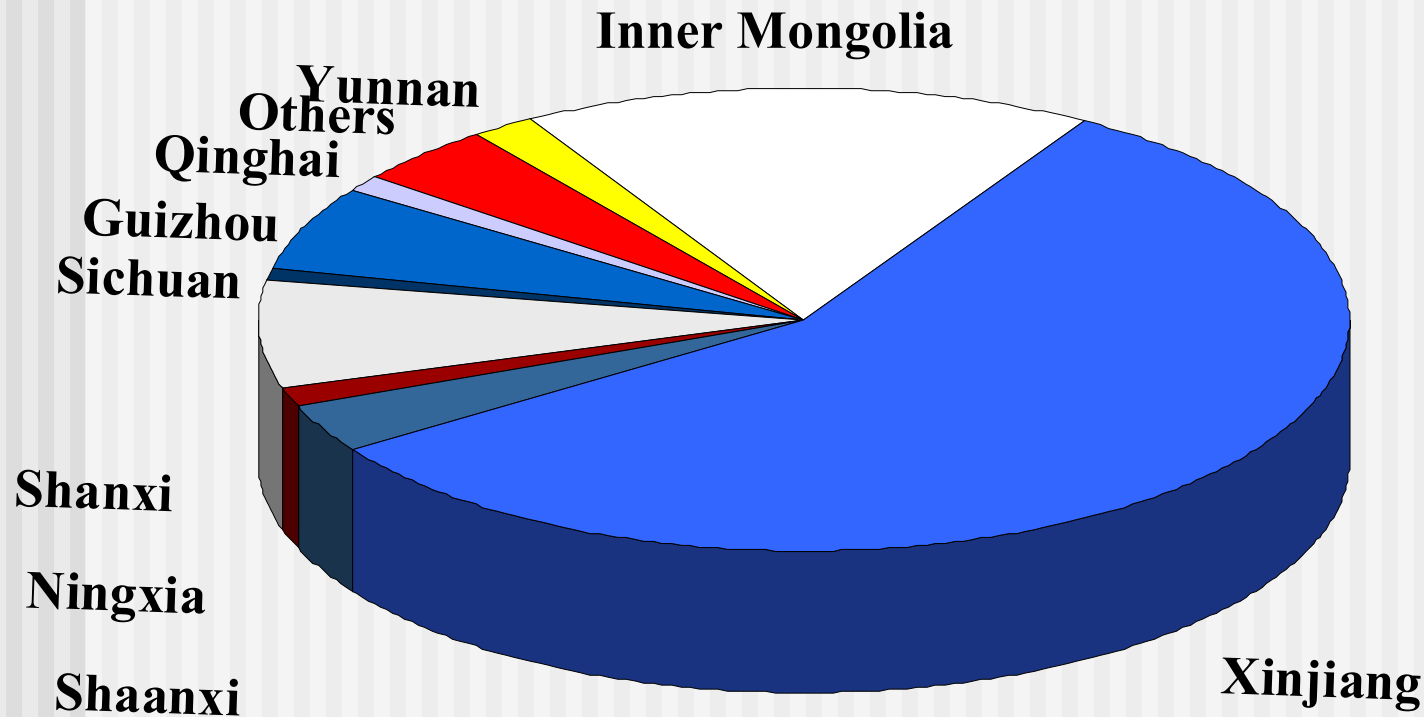
Shaanxi, Gansu, Ningxia, Qinghai  
and Xinjiang 1174.21 billion tons

Shanxi, Inner Mongolia  
and Hebei 450.46 billion tons

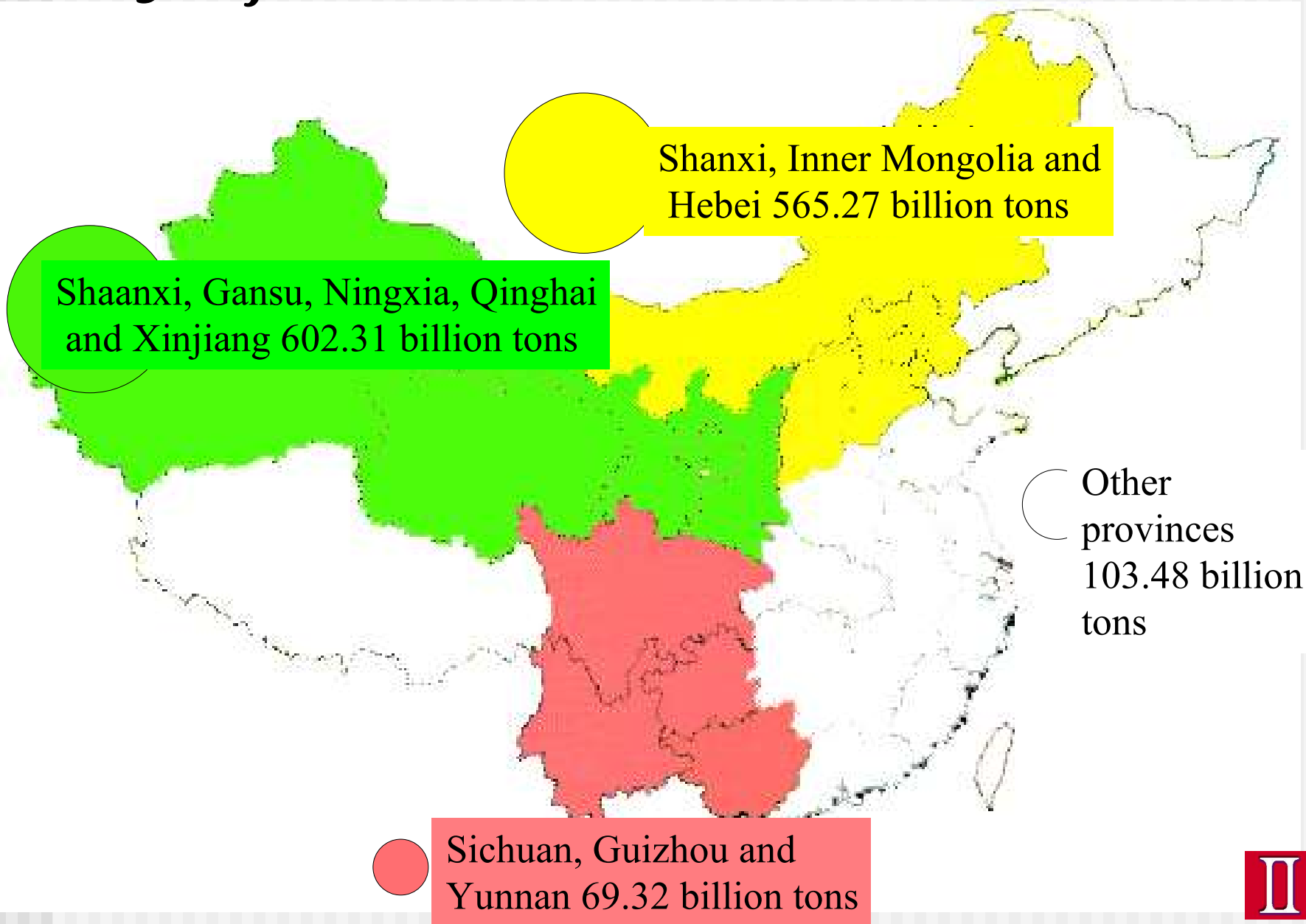
Other provinces  
61.7 billion tons

Sichuan, Guizhou and Yunnan  
157.68 billion tons

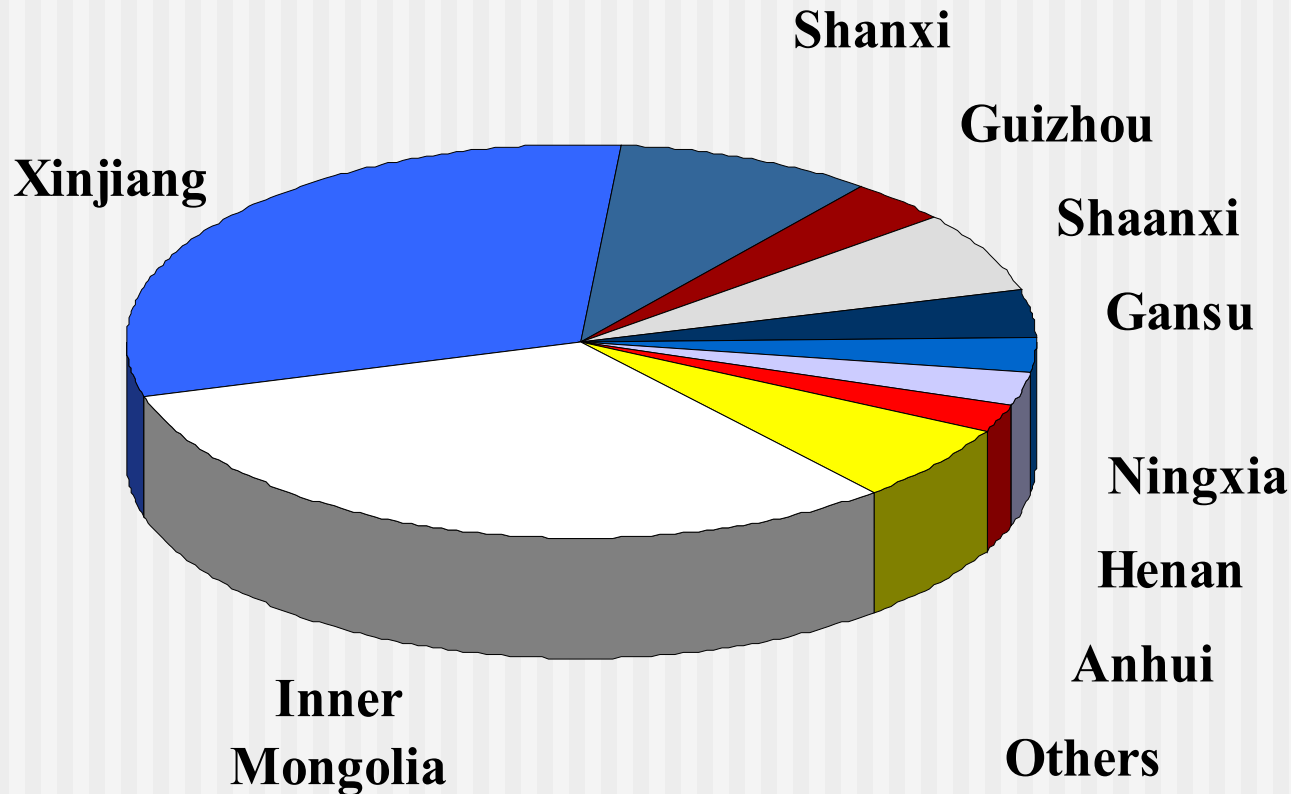
# Chinese Forecasted Coal Reserves ( Depth within 1000m )



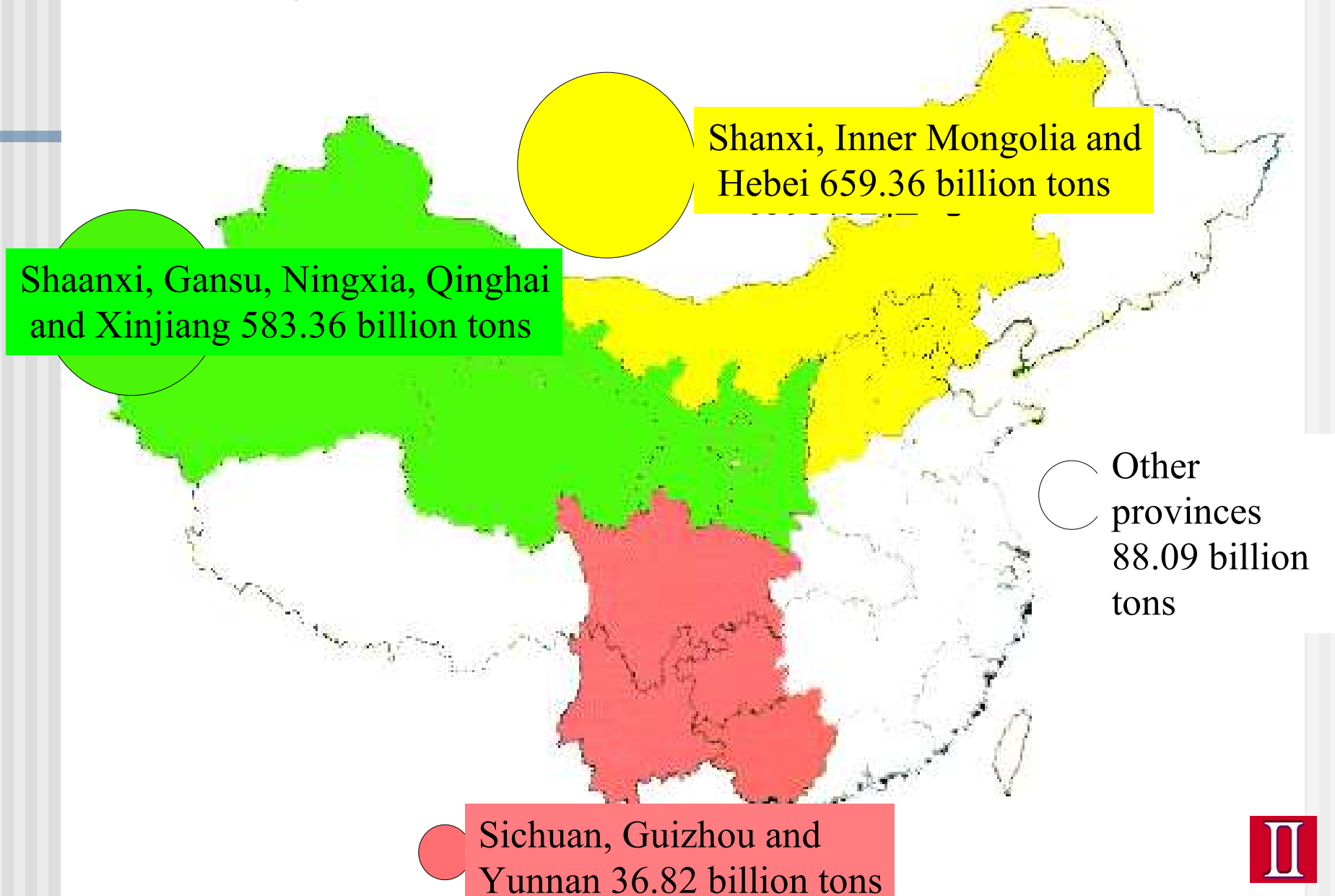
# Chinese Forecasted Coal Reserves (Depth:1000-1500m)



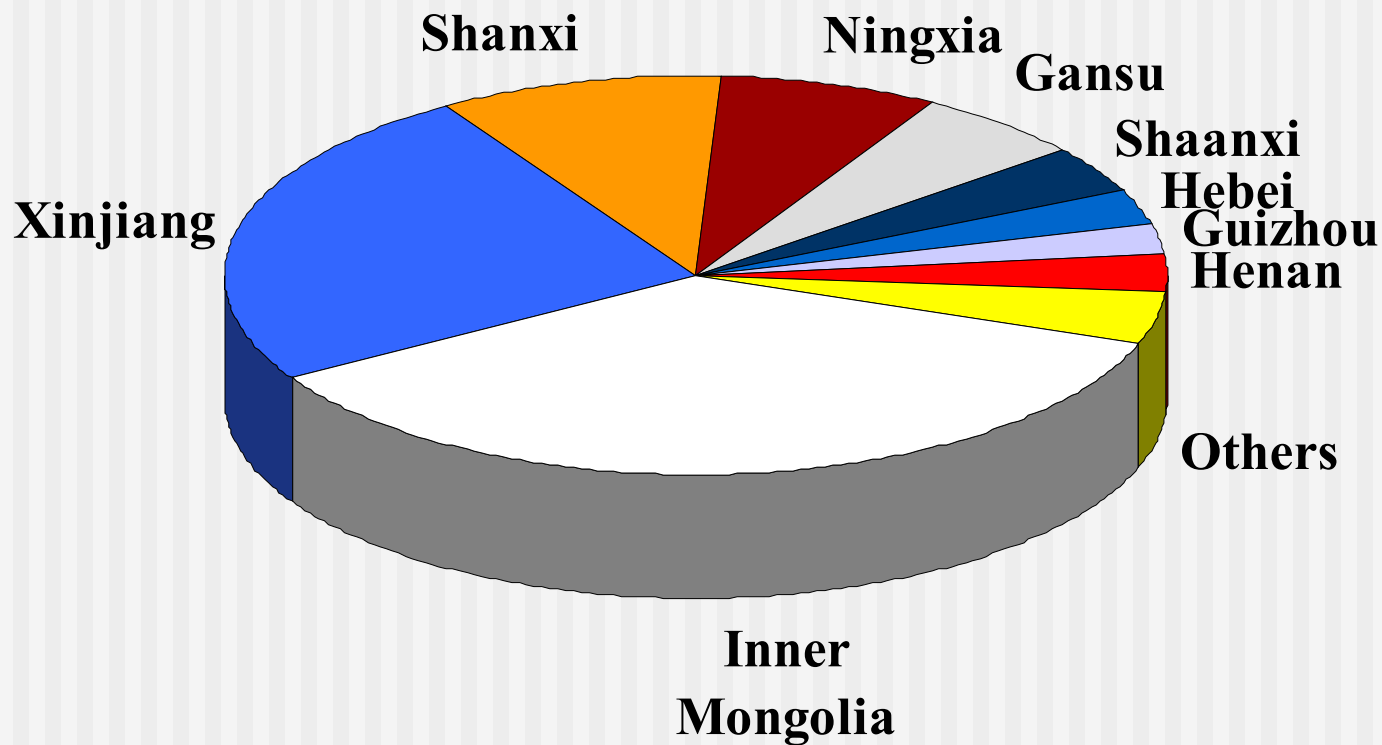
# Chinese Forecasted Coal Reserves ( Depth 1000 - 1500m )



# Chinese Forecasted Coal Reserves (Depth:1500-2000m)

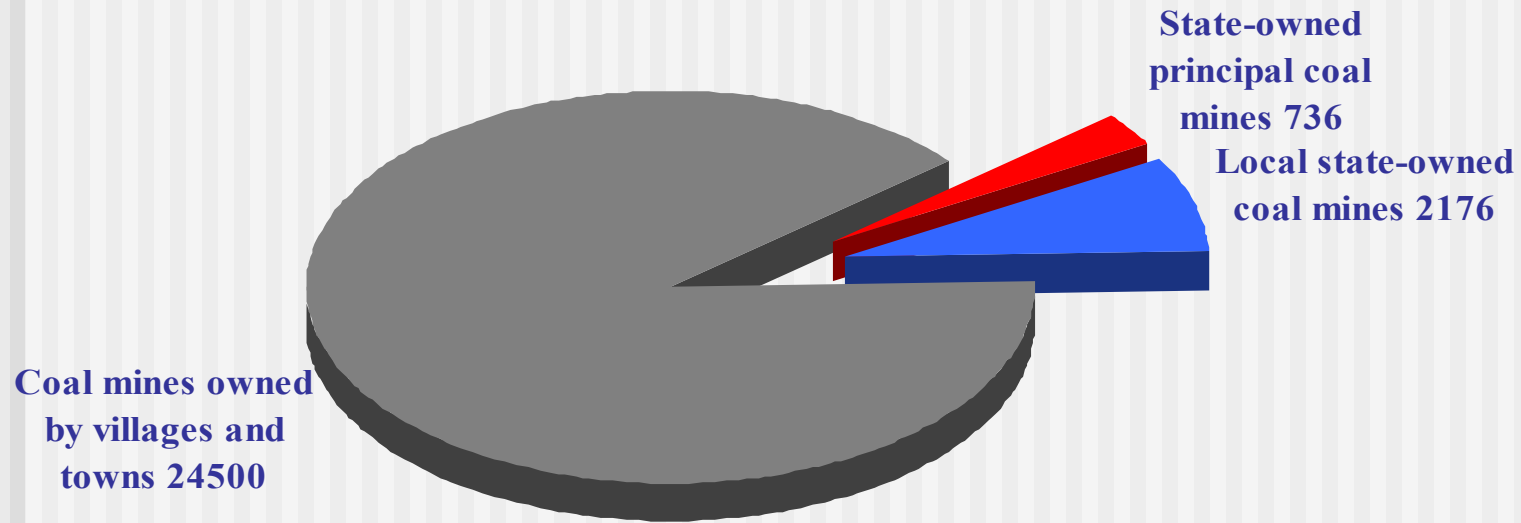


# Chinese Forecasted Coal Reserves ( Depth 1500-2000m )



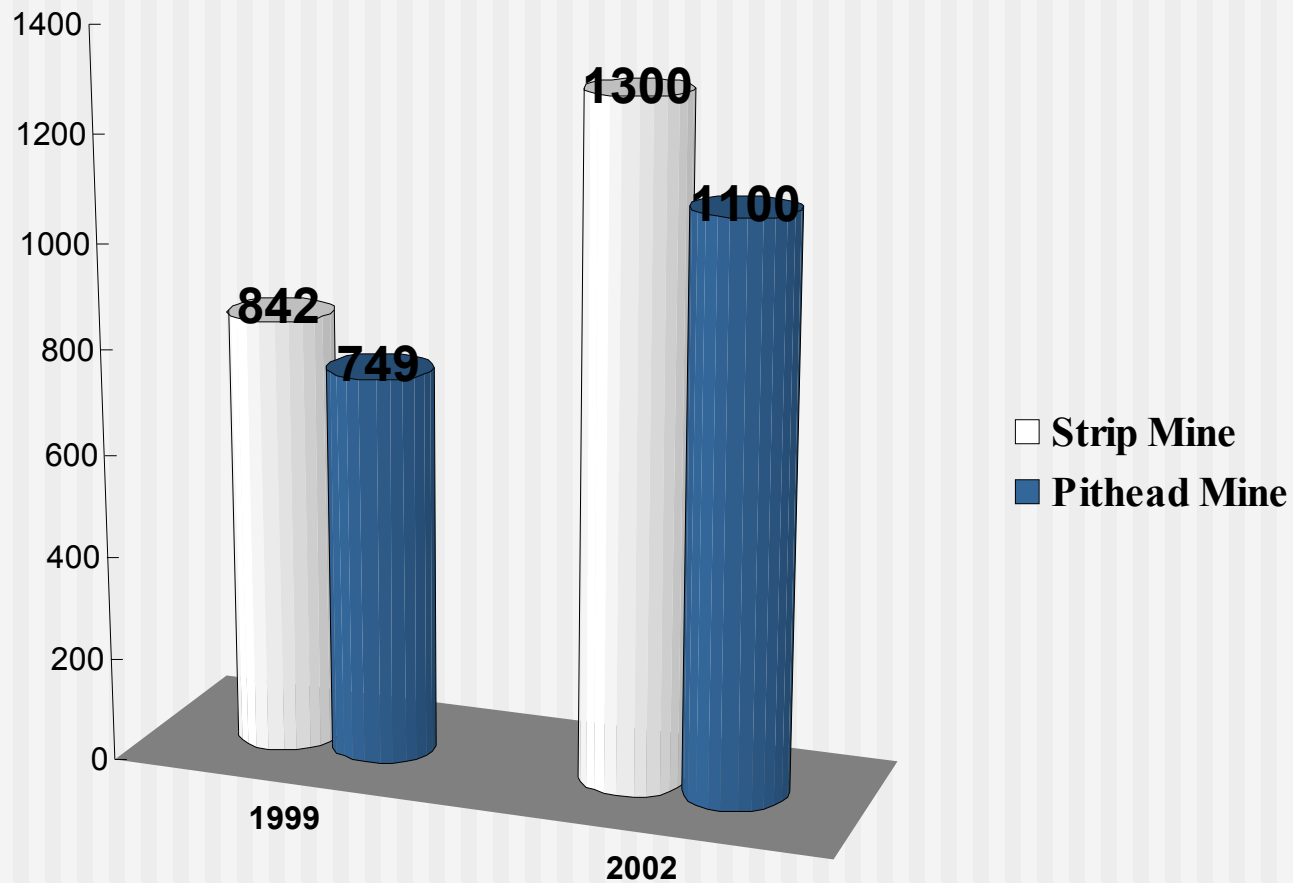


# Number of Chinese Coal Mines



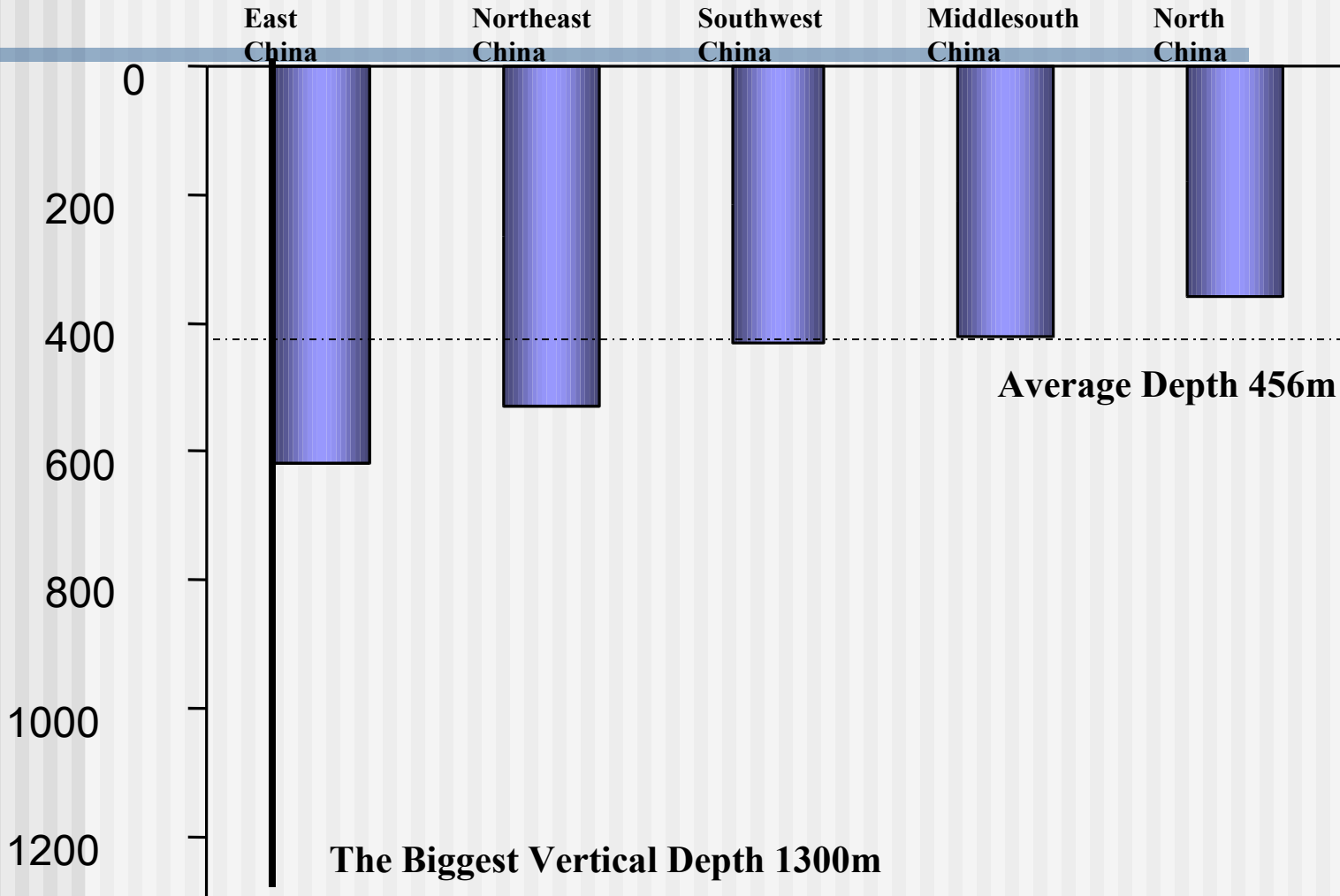


# Number of American Strip Mines and Pithead Mines

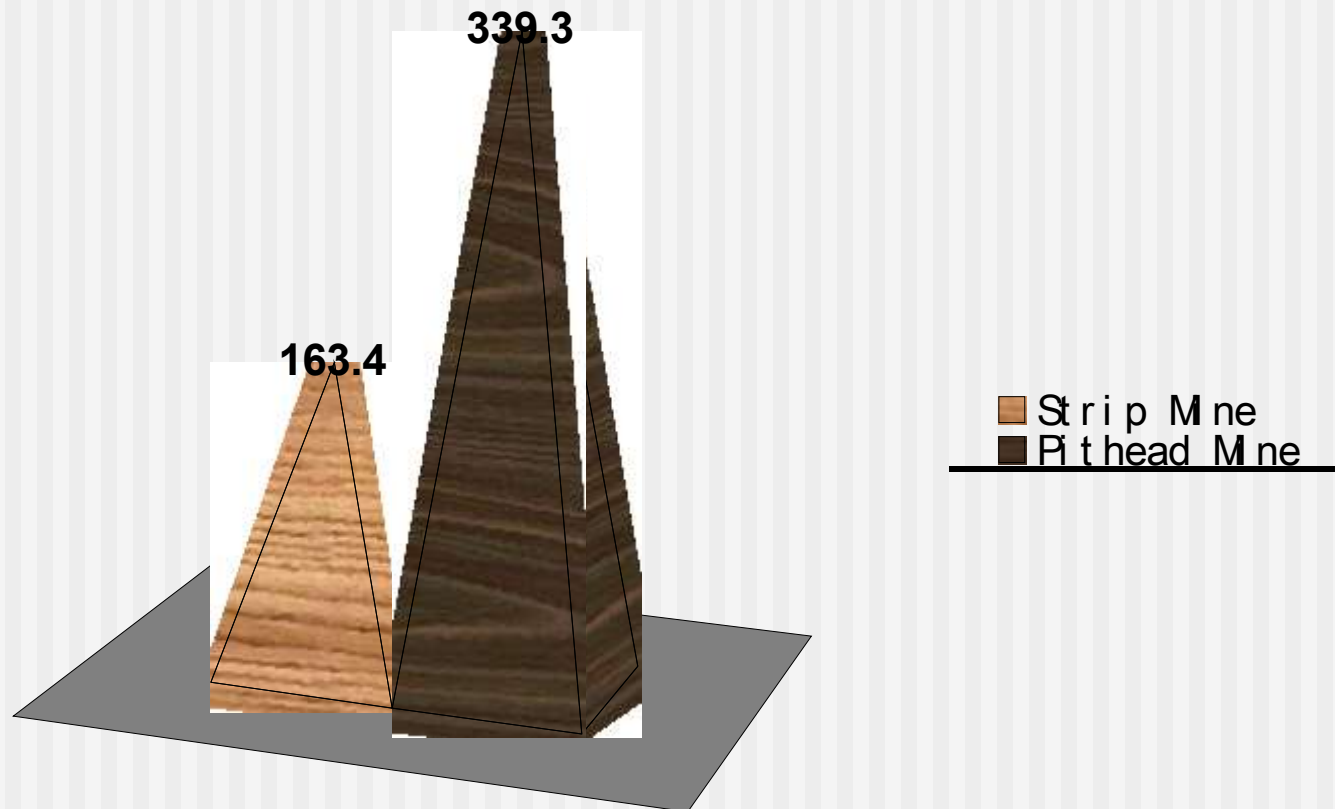




# Chinese Coal Mine Exploration Depth



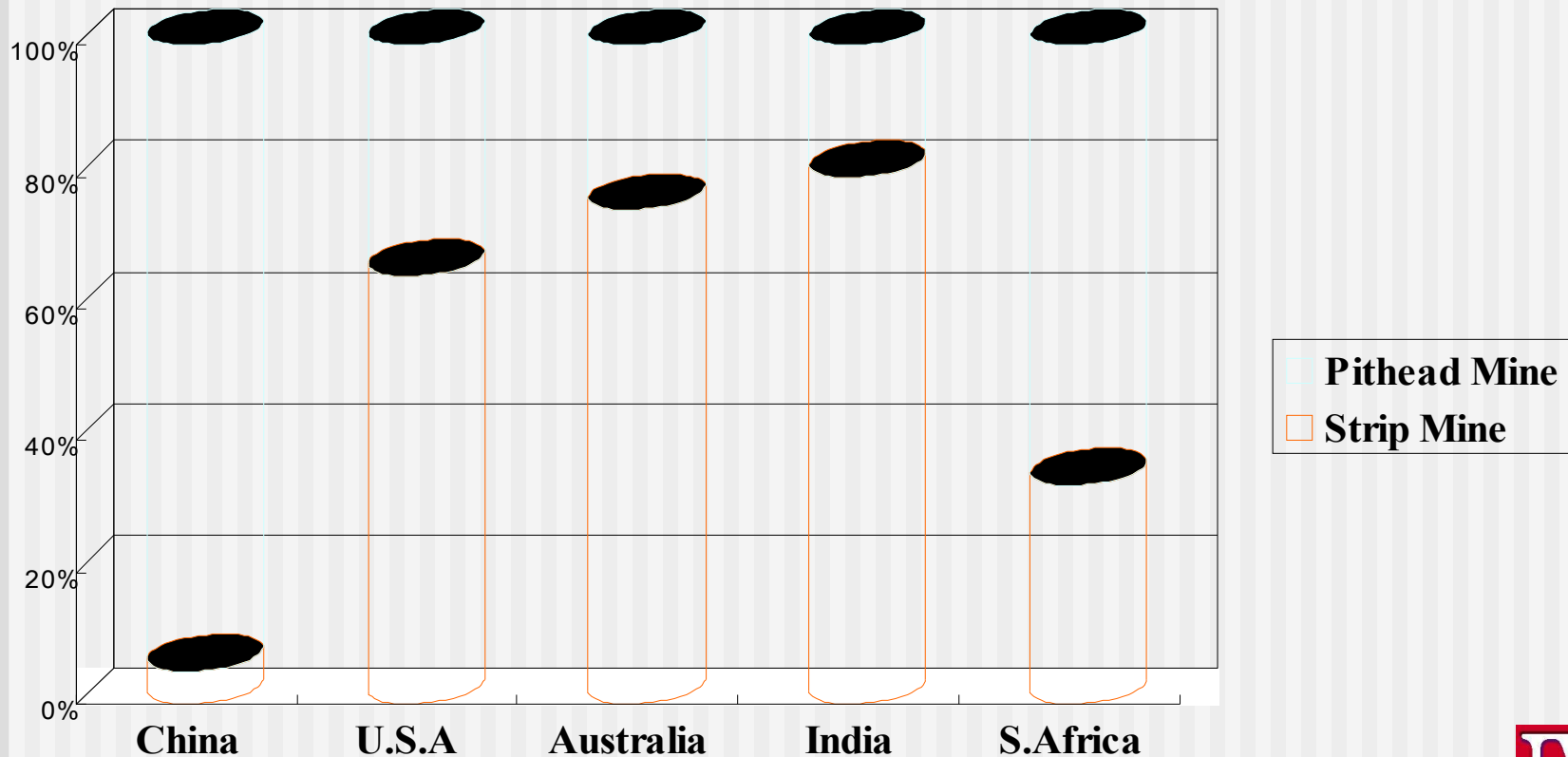
# Reserves of American Strip Mines and Pithead Mines



EIA1999(Unit : billion tons)



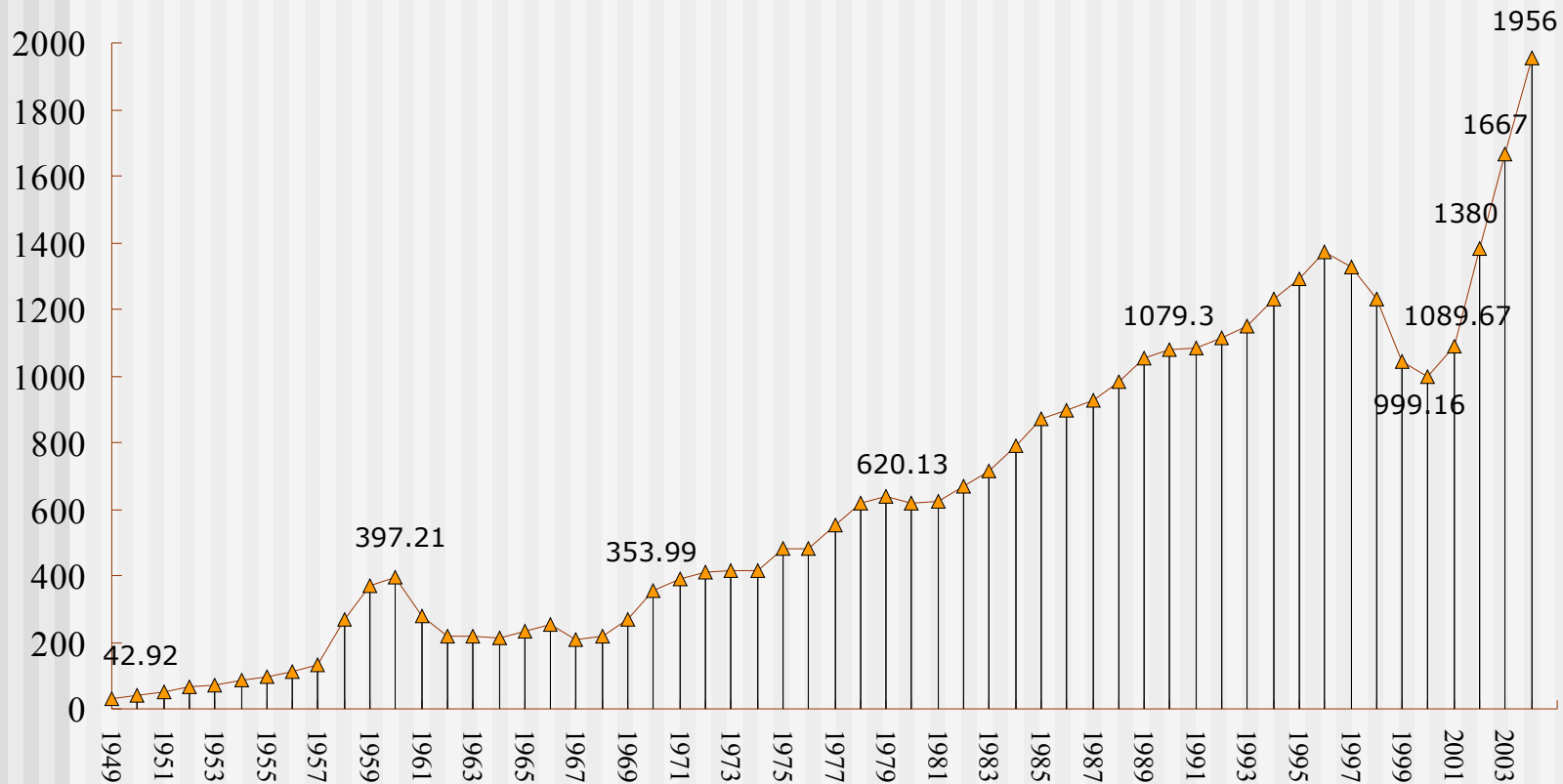
# The Output of Main Coal Producers' (Strip Mine and Pithead Mine)





# Chinese Coal Yield

## Chinese Coal Output 1949-2004 (Unit: Million Tons)





# Chinese Coal Yield

## The composition of coal output of China in 2004

**Coal mines  
owned by  
villages  
and towns  
38%**



**State-  
owned key  
coal mines  
47%**

**Local state-  
owned coal  
mines 15%**





## Conclusion Remarks

- Exploitation of the coal with depth more than 1500~2000m is very difficult ---- increase of cost, unsafety, disaster gas blast.
- Injection of CO<sub>2</sub> into unminable coal seams is a win-win strategy ---- exploitation of huge amount of CH<sub>4</sub> and a nature reservoir of CO<sub>2</sub> storage.
- The unminable deep coal reserves is about 30% of the total, in average, absorbed CH<sub>4</sub> in coal is 10~20m<sup>3</sup>/t.
  - ❖ The amount of CH<sub>4</sub> in deep coal seams which could be obtained by CO<sub>2</sub> injection is 13Tm<sup>3</sup> (37% of the total estimated reserves in China).
  - ❖ Theoretically, 2mols of CO<sub>2</sub> could “squeeze” out 1mol of CH<sub>4</sub>.
  - ❖ The amount of CO<sub>2</sub> which could be stored in unminable deep coal seams is 30Gt (10 times of the CO<sub>2</sub> emitted in China annually).





## Conclusion Remarks

- The areas of abundant unminable coal reserves coincide with the areas of abundant minable coal reserves (with depth less than 1000m). It is easy to be arranged:
  - ❖ On-site exploitation
  - ❖ On-site transformation (power, liquid fuels, chemical...) via Polygeneration
  - ❖ On-site capture (sequestration)
  - ❖ On-site injection and sequestration (enhancement of CBM production)





## Further Works

- Detailed survey and analysis of reserves of deep unminable coal seams, their distribution, the physical and chemical characteristic of the coal (permeability, contents of CBM, etc.)
- The absorb ability and desorb ability of  $\text{CH}_4$  and  $\text{CO}_2$  for diverse coal, the basic mechanism, establishment of mathematical model, experimental and simulation study
- The flow pattern of underground injected  $\text{CO}_2$  and desorbed  $\text{CH}_4$ , the requirement of well-drilling and distribution, modeling and simulation
- Strengthen the international cooperation (Alberta Research Council, Canada and other institutions)





*Thank You*