

Carbon Emission Baselines of power generation: Comparison of Indian States with Chinese Provinces

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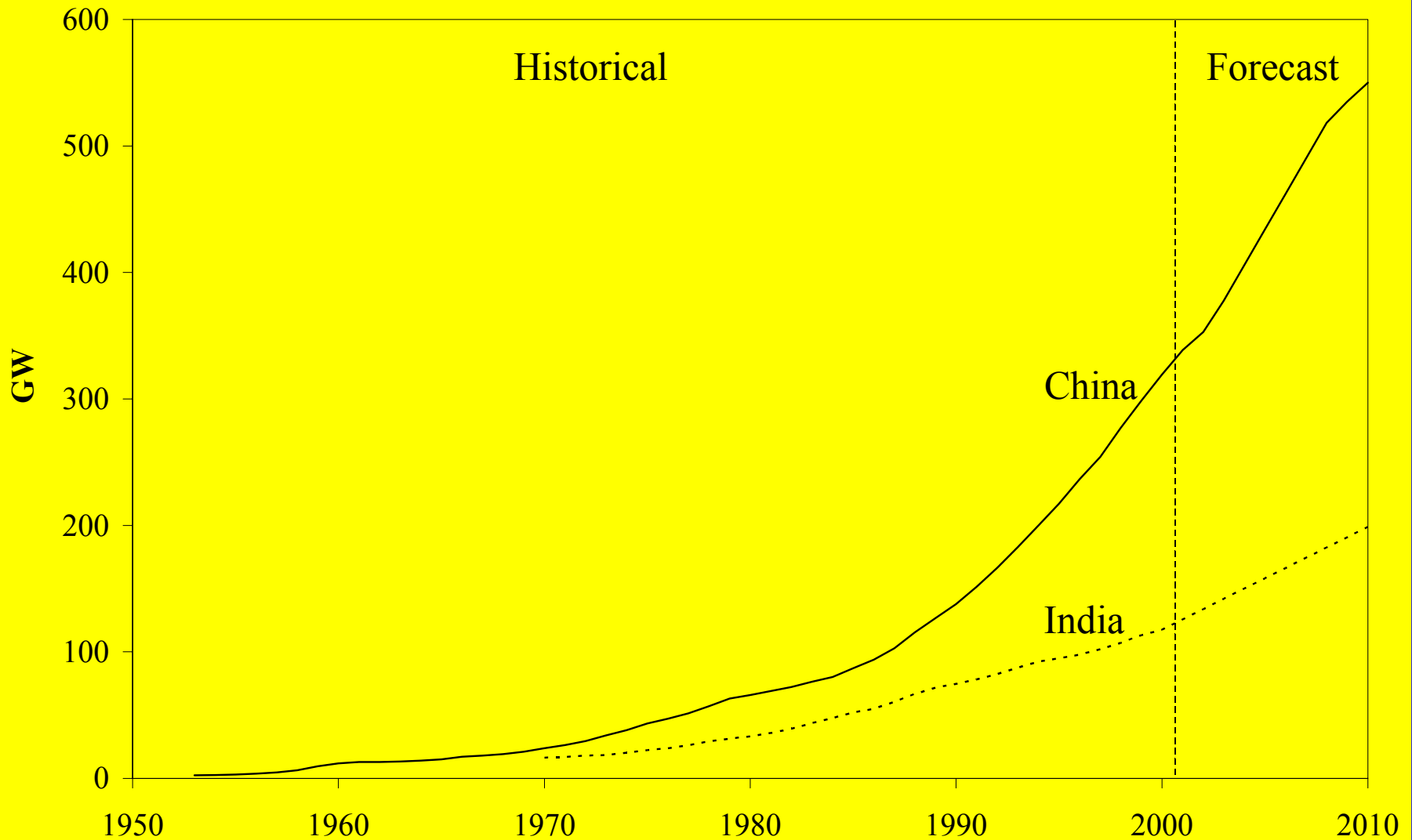
Outline

- 1. The baseline issue**
- 2. Case profiles**
- 3. Baselines and drivers**
- 4. Policy implications**

Baseline Issue

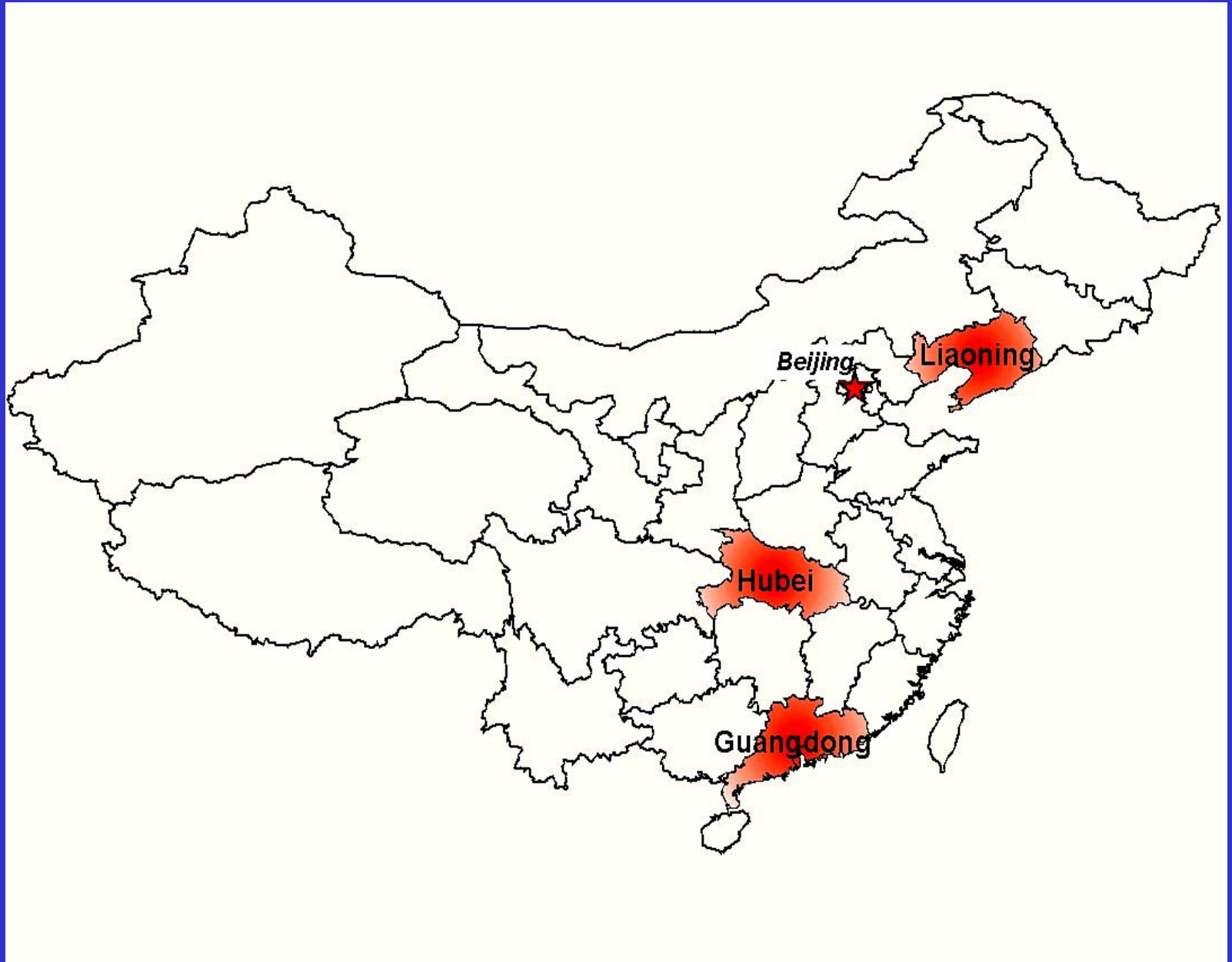
- **Need for GHG emission baselines**
 - **Rising GHG emissions in India and China**
 - **CDM of Kyoto Protocol as policy tool to engage the countries**
 - **Emission baselines as gauge of “additionality”**
- **Approaches to baselines**
 - **Project profitability**
 - **Sectoral benchmark**
- **Estimating carbon emission baselines in India and China**
 - **Power generation baselines (40% and 25% of national carbon emissions in India and China)**
 - **State/provincial baselines (regional variations)**

Installed capacity - India and China

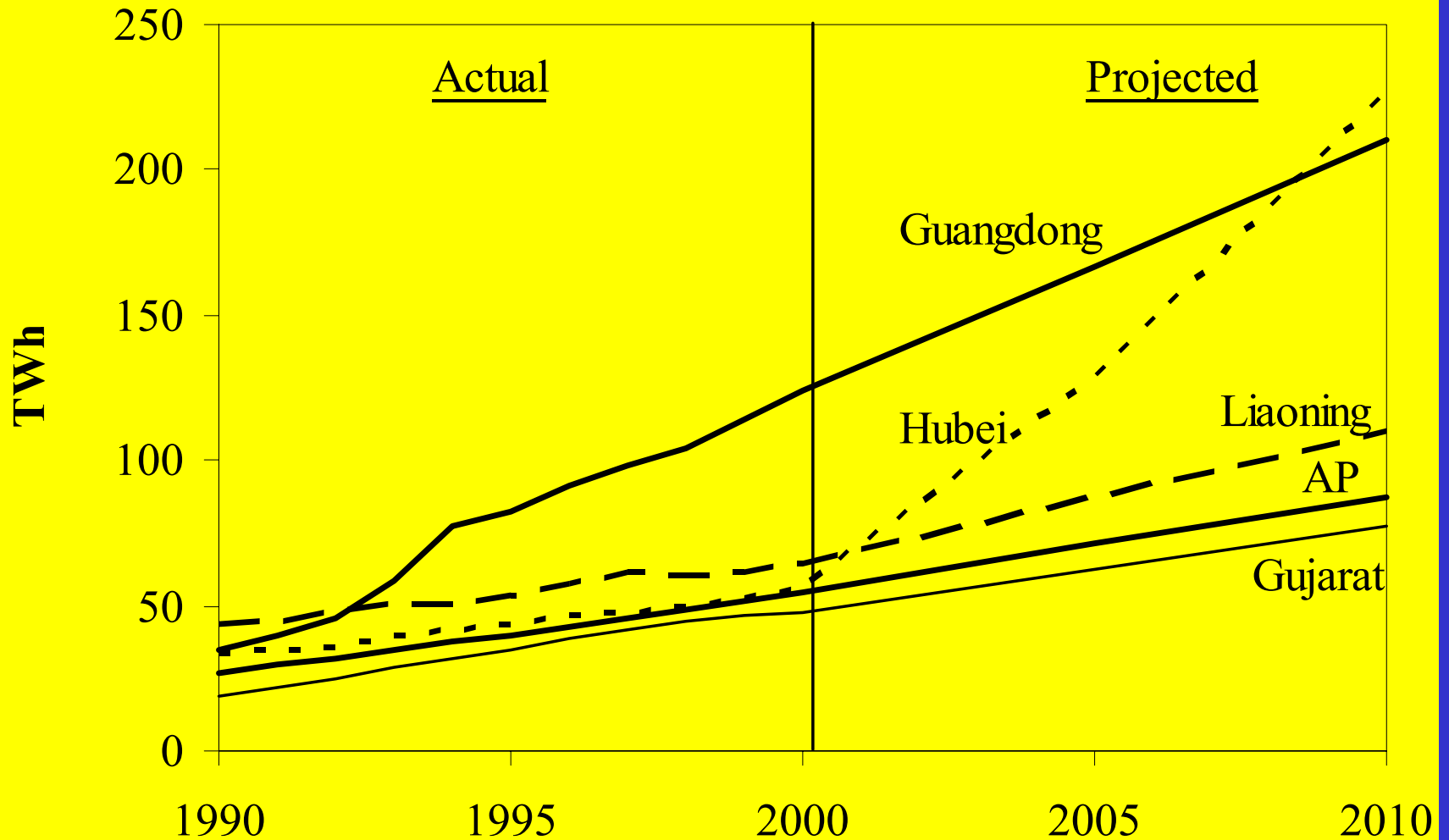


Case Profile (1998)

	India			China			
	All India	AP	Gujarat	All China	GD	LN	HB
Population (mil)	982	74.3	48.6	1248	71	41	59
Area (1000 sq. km)	3287	275	196	9600	178	148	186
GDP (\$ billion)	414	25.5	23.4	944	95	47	45
GDP Growth (1980-98)	6.0	4.6	7.2	9.5	14.4	9.0	10.5
p.c.Income (\$)	420	344	495	760	1340	1134	758
Installed Capacity (GW)	101.6	7.98	8.58	277	29	14	13
Generation (TWh)	501.2	45.7	47.9	1157	104	60	50
p.c. Consumption (KWh)	355	391	835	929	1388	1653	769



State power generation

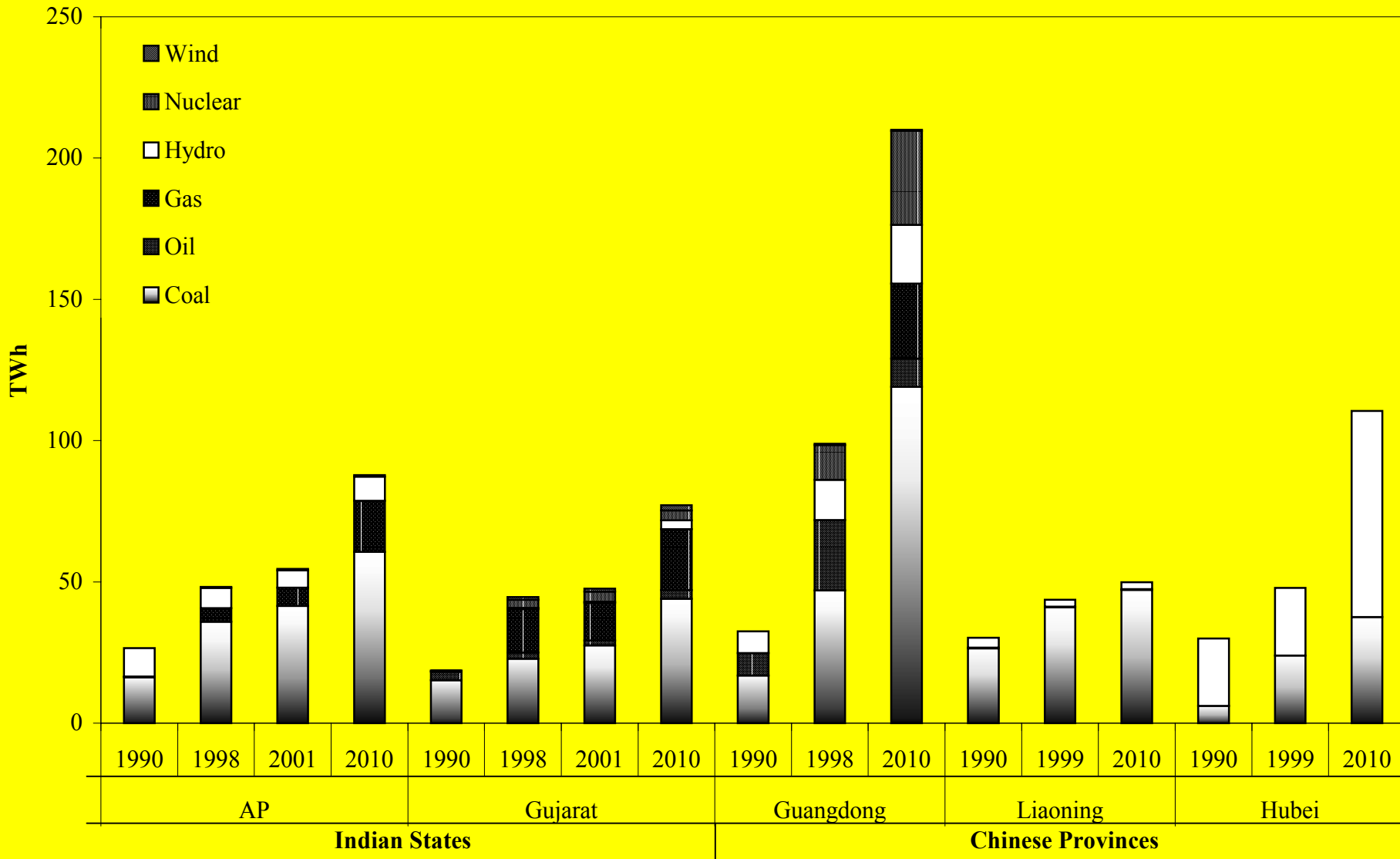


Drivers of CO₂ Emissions

➤ Fuel structure

- **Coal dominant system in all cases**
- **Regional and overtime variations**
 - **India: Large but declining share of hydro in AP; Coal dominance in Gujarat; Rising share of natural gas in both States**
 - **China: Coal dominance strengthening in GD and LN; Development of cleaner fuel expected in HB (hydro) and GD (gas and nuclear)**

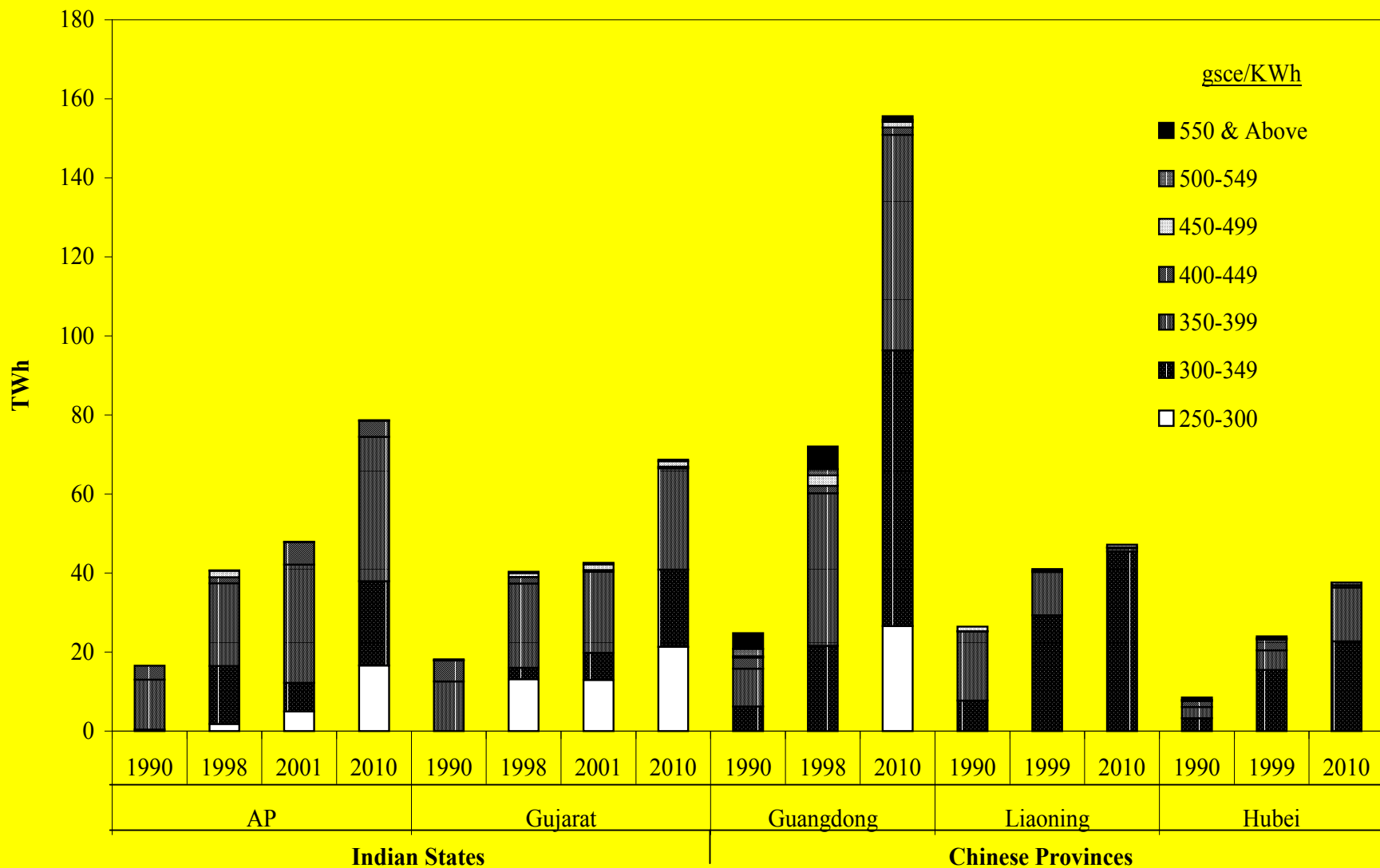
Fuel structure of power generation



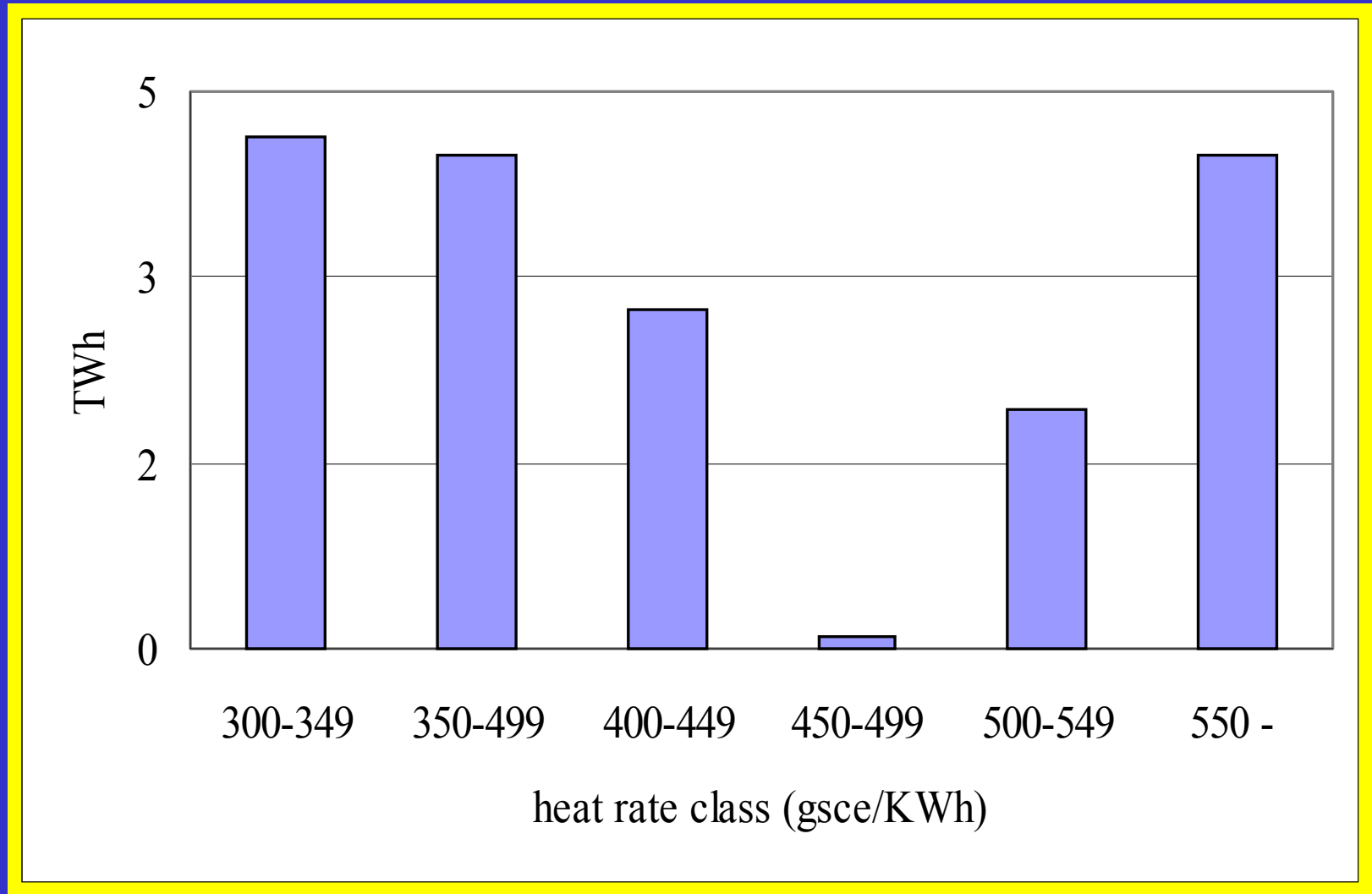
Drivers of CO₂ Emissions

- **Heat rate of fossil fuel generation**
 - **Improved technology and coal combustion efficiency in all cases**
 - **Improved heat rate of fossil fuel generation thanks to natural gas and naphtha, esp. in AP and Gujarat**
 - **Continuous adoption of small dirty coal-fired plants in some Chinese provinces, esp. GD**

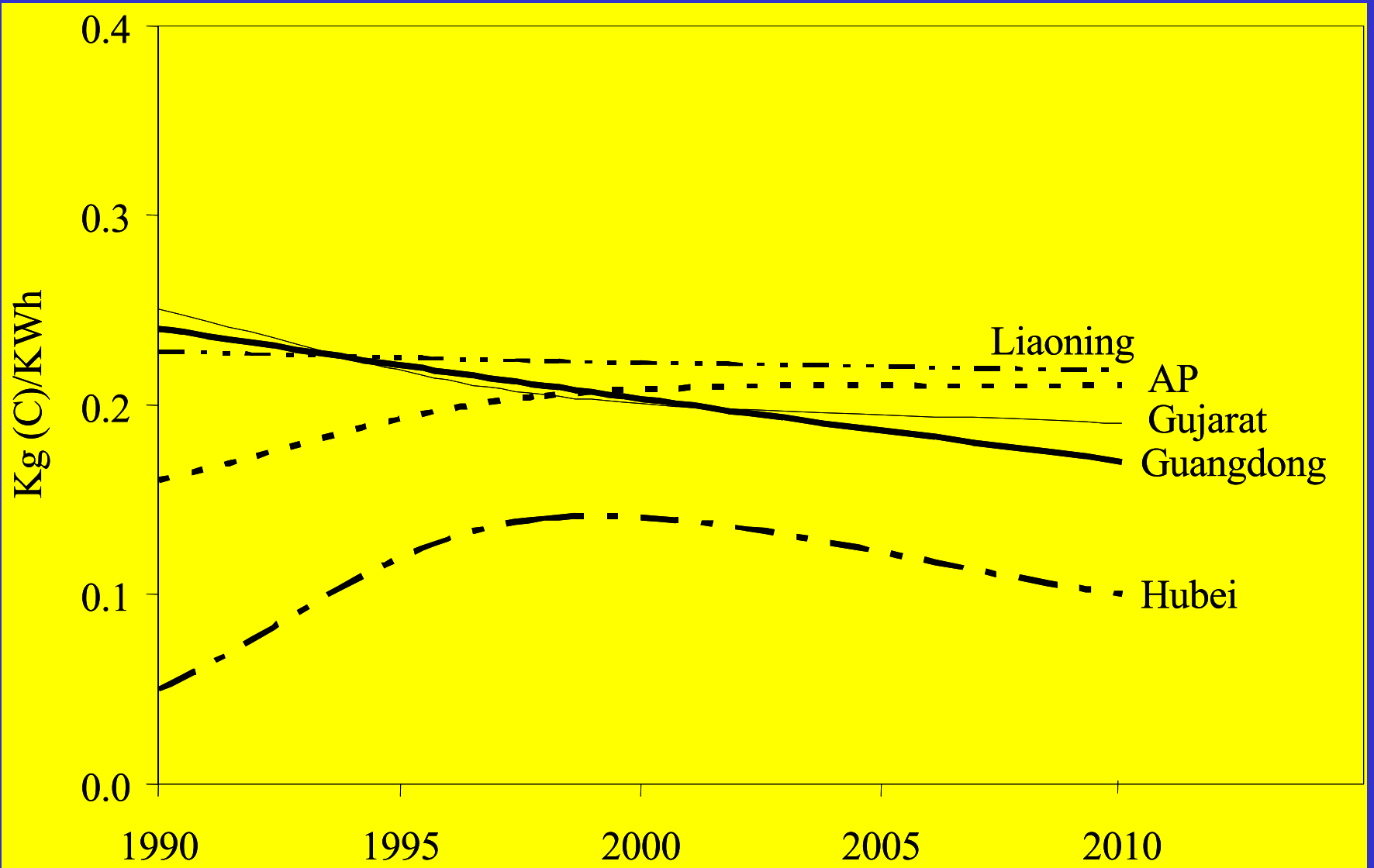
Heat rate of power generation



GD coal-fired generation (1990)



CO₂ emission baselines



CO₂ emission baselines

- **Power generation friendlier to global environment**
- **Fuel mix factor more important than thermal efficiency factor**
- **Higher carbon intensity by international standard expected**

Factor of fuel and technology choices

- **Central government policy**
 - **Favoring local generation and locally available fuels**
 - **Industrial policy and trade protection**
 - **Privatization in India, decentralization in China**
 - **Cleaner energy policy and central planning in China**
- **Relative cost of coal**
- **Financial constraint**
- **Political influence of local government**

Policy Implications

- **Opportunities exist in the Indian and Chinese electricity sectors to lower carbon intensity**
- **Establishing a baseline as a reference for CDM crediting requires detailed and careful industry analysis**
- **Alternative approaches that rely on more aggregated baselines merit examination**