How to use modelling tools to answer questions on policy making in China

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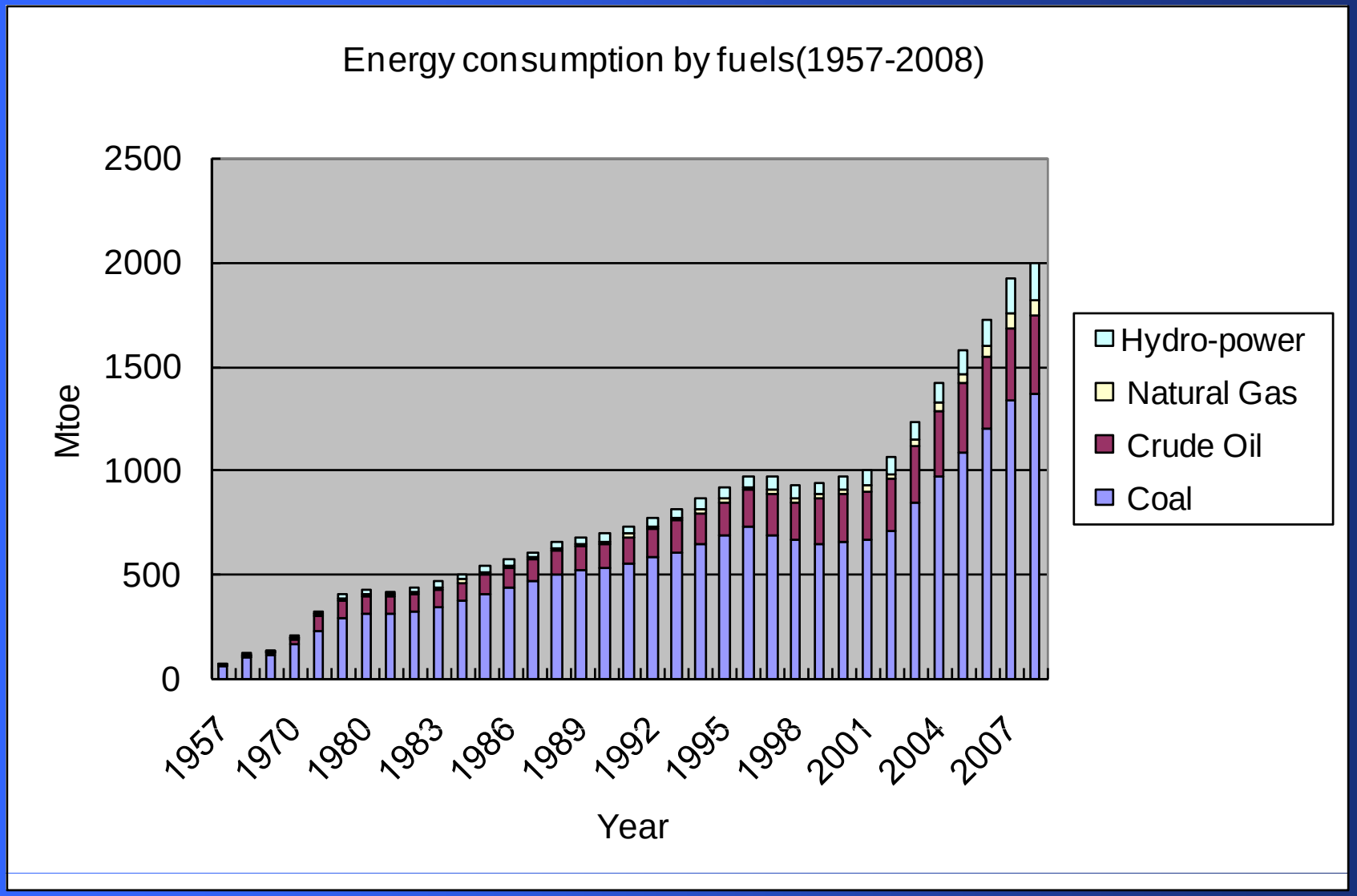
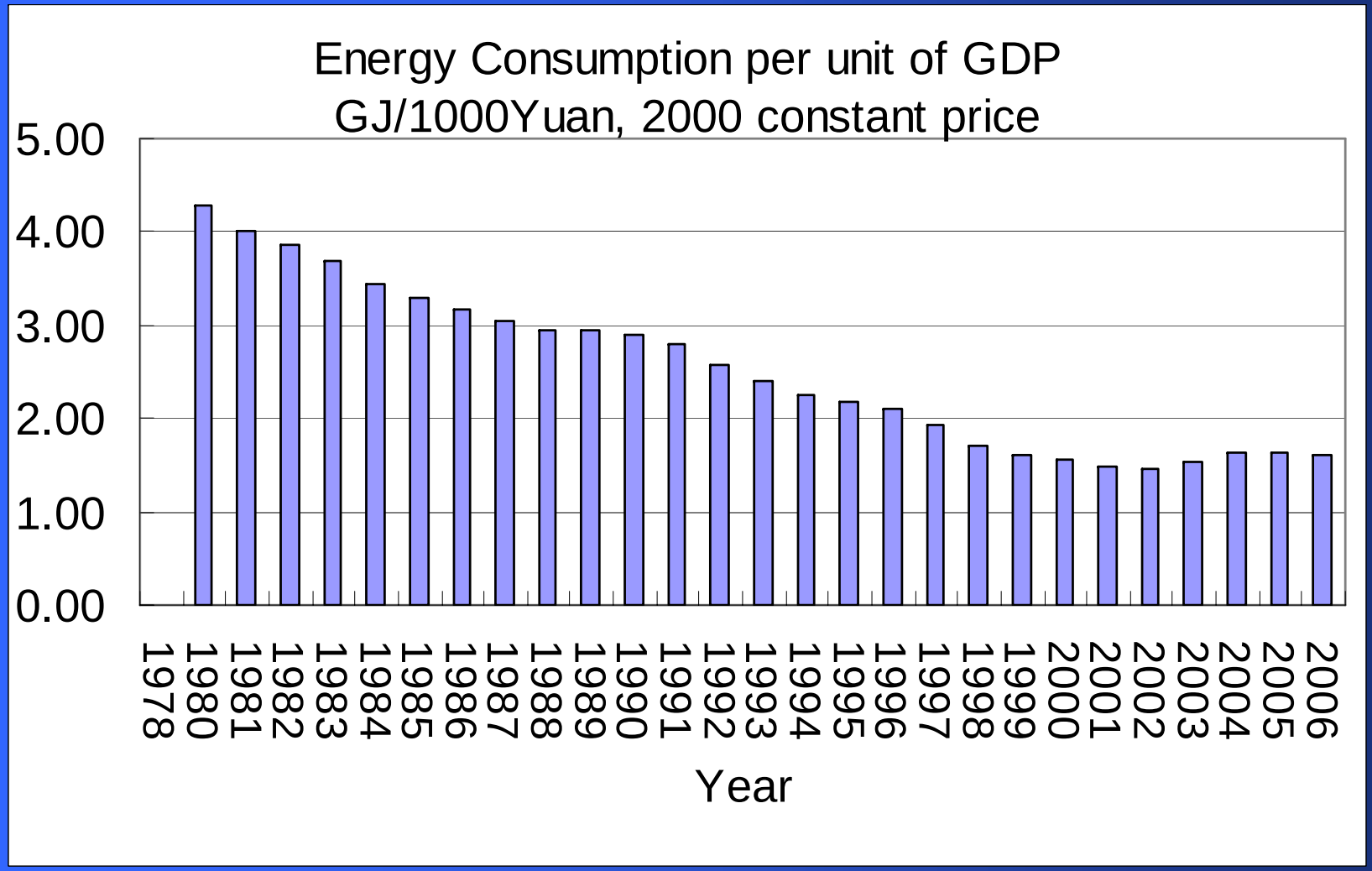
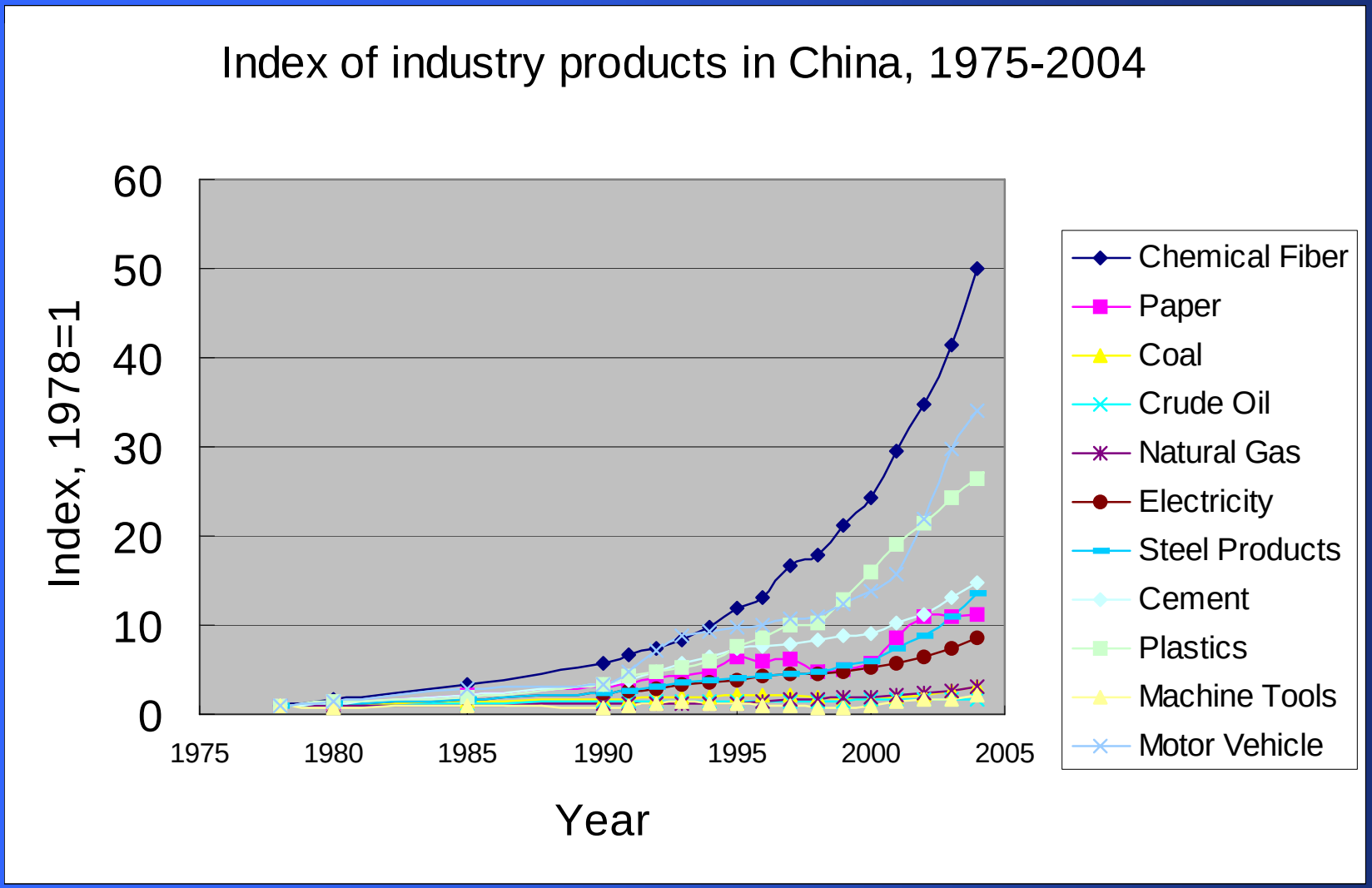
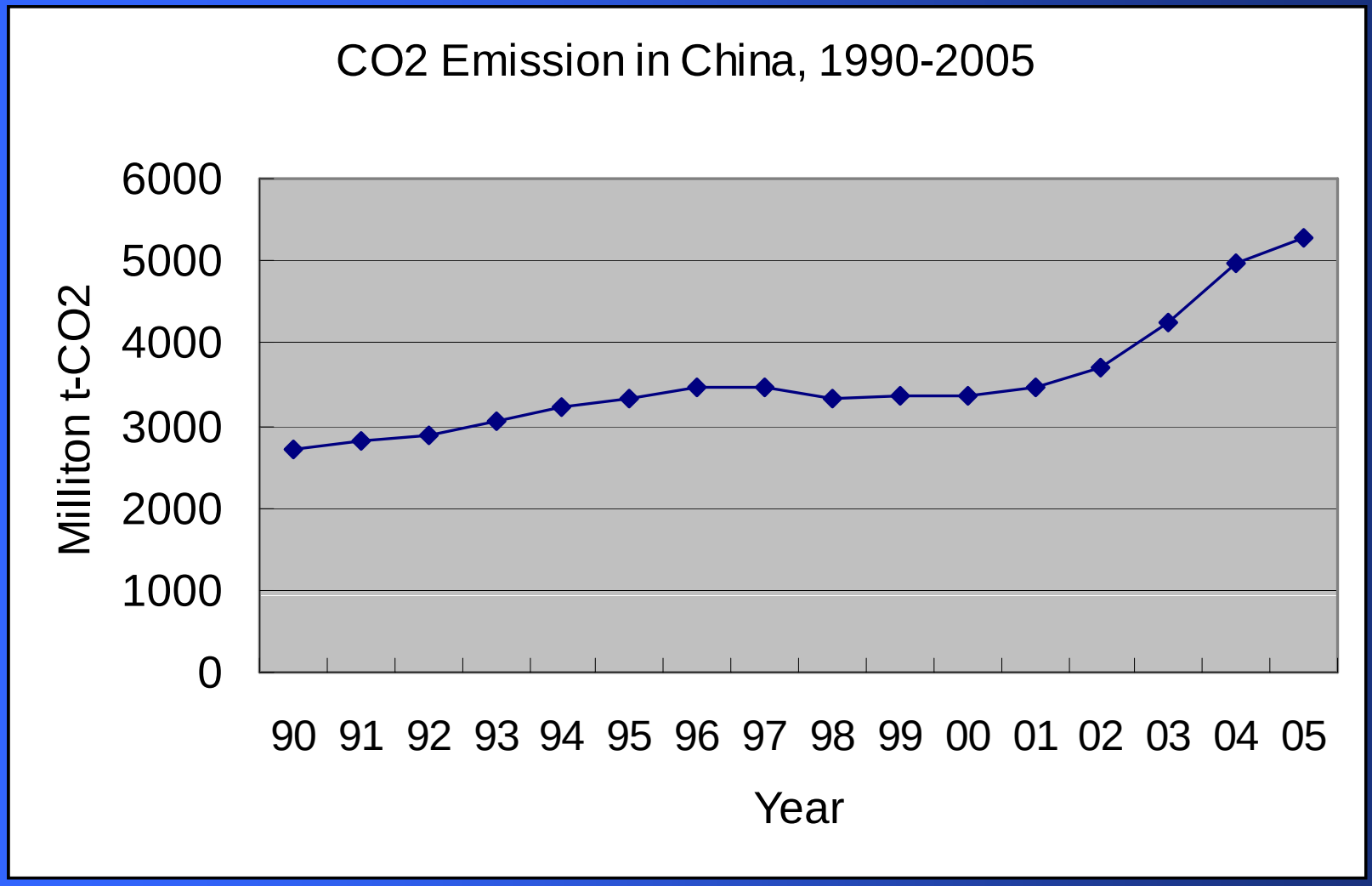

Energy consumption by fuels(1957-2008)
2500
2000
1500
1000
500
0
Mtoe
1957
1970
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007
Year
Hydro-power
Natural Gas
Crude Oil
Coal


Energy Consumption per unit of GDP
GJ/1000Yuan, 2000 constant price
5.00
4.00
3.00
2.00
1.00
0.00
1978
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
Year


Index of industry products in China, 1975-2004
Index, 1978=1
60
50
40
30
20
10
0
1975
1980
1985
1990
1995
2000
2005
Year
Chemical Fiber
Paper
Coal
Crude Oil
Natural Gas
Electricity
Steel Products
Cement
Plastics
Machine Tools
Motor Vehicle


CO2 Emission in China, 1990-2005
Milliton t-CO2
6000
5000
4000
3000
2000
1000
0
90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05
Year

What is happening now on policy

- Negotiation in COPs, Copenhagen and after that
- 12th Five Year Plan on Energy, Climate change
- Low Carbon Development Planning and Strategy
- National long-term energy plan

Table 4. Major policies announced recently

Classification	Policies
Administration	Establishing energy conservation and emission reduction steering group chaired by Prime Minister (June 2006); Distributing targets to each province (September 2006)
Overall National Policies	Synthesizing Working Program for Energy Conservation and Emission Reduction (June 2007); Revised Energy Conservation Law (October 2007); Integrated Resource Utilization Guidance (January 2007); Guidance for Accelerating Energy Conservation Service Industry (2008); Guidance Catalog for industry structure change (annual)
Monitoring	Implementation Program of Energy Intensity Per GDP Statistic Index System (Nov. 2007), Implementation Program of Unit Energy Use Per GDP Exam (Nov. 2007), Implementation Program of Unit Energy Use Per GDP Monitoring (Nov. 2007)
Pricing/Financing	Differentiating energy prices for key energy-intensive industries
Standardization	Second catalog of energy efficiency labeling for consumer products (Sep. 2006); Third catalog of energy efficiency labeling for consumer products (January 2008)
Industry	1000 large energy users monitoring program by national government (April 2006); extending provincial large energy user monitoring program (April 2006); closure of small-size industry in energy intensive sectors including cement, steel, non-ferrous, chemistry etc. (June 2006); approval for new projects based on energy efficiency standard (January 2007)
Transport	Light Vehicle Fuel Efficiency Standard (Sep. 2007)
Buildings	11th Five Year Plan for Energy Conservation in Buildings (February 2006); Building Efficiency Standard Implementation (June 2007)
Power generation	Closure of small power plants (January 2007), regulation for newly installed coal-fired power plants to be most advanced power plants

Negotiation

- Targets? By 2020, 2030 or 2050? Intensity or absolute targets?
- Commitment: domestic targets or actions, MRV, sector based approach
- Cost and benefit?
- Technology transfer needs?

Domestic climate change strategy

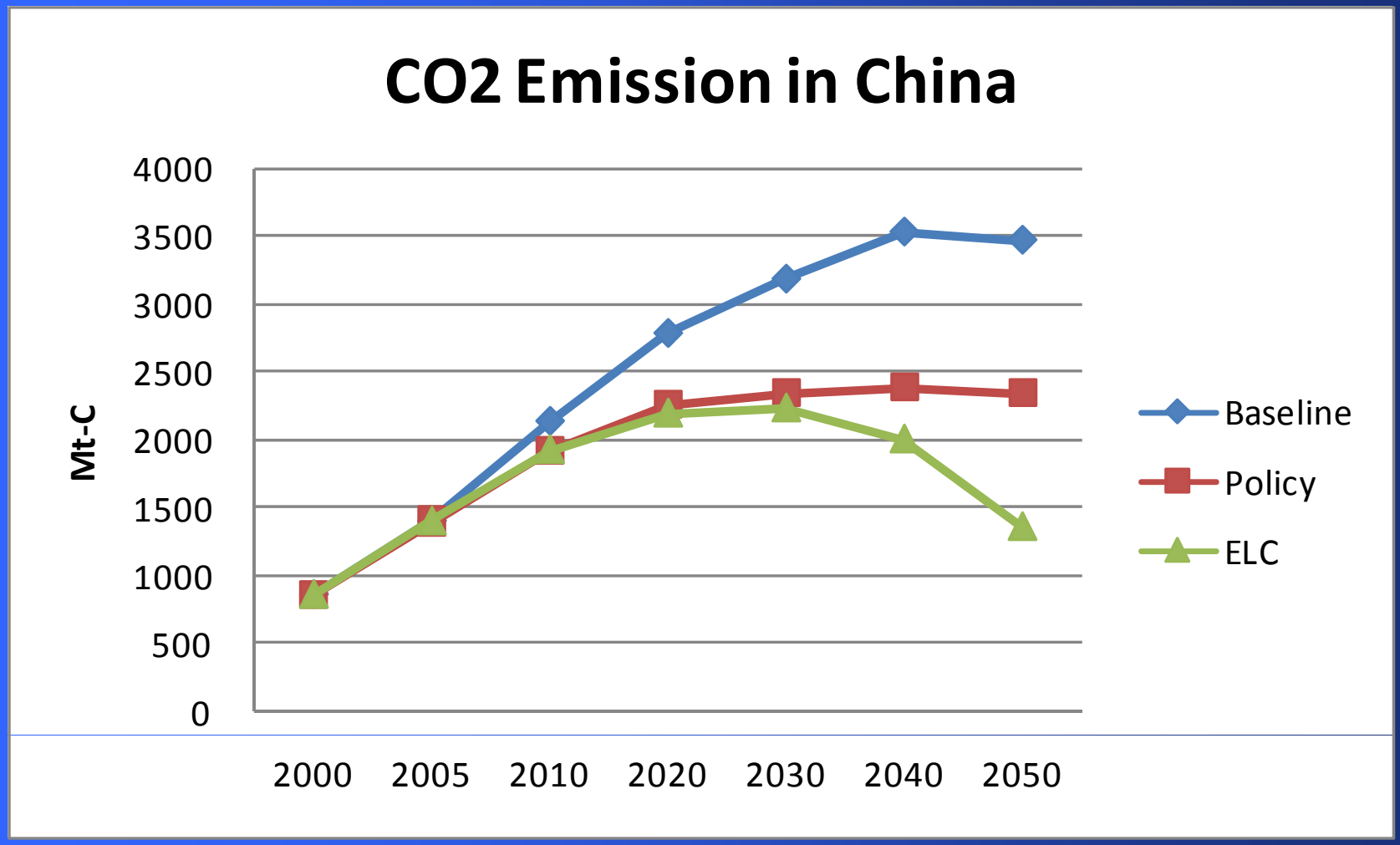
- What is the targets of GHG in China? Short-term and long-term?
- Key policies and countermeasures for low carbon future
- Long-term Energy and emission pathways?
- Economy development pattern?
- Technology R&D strategy? What kind of technologies?
- Near-term action and policies? Cost and benefit of these near-term policies?

Using modeling tools

- Scenarios: pathways, targets (intensity and absolute)
- Cost analysis: wide range of cost analysis
- Multi-development targets analysis
- Benefit analysis by taking low carbon economy
- Co-benefit analysis (GHGs, local pollutions, water pollutions, and others)
- Integrated analysis

What we are doing

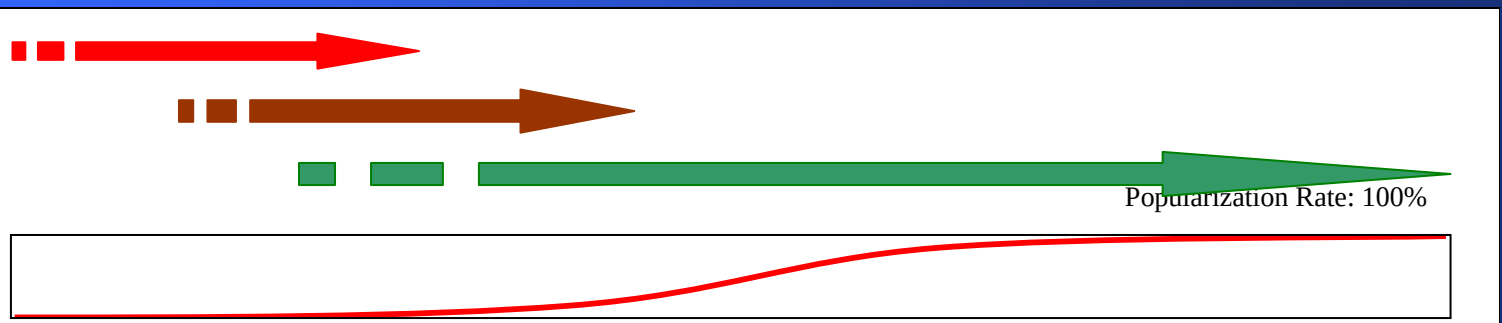
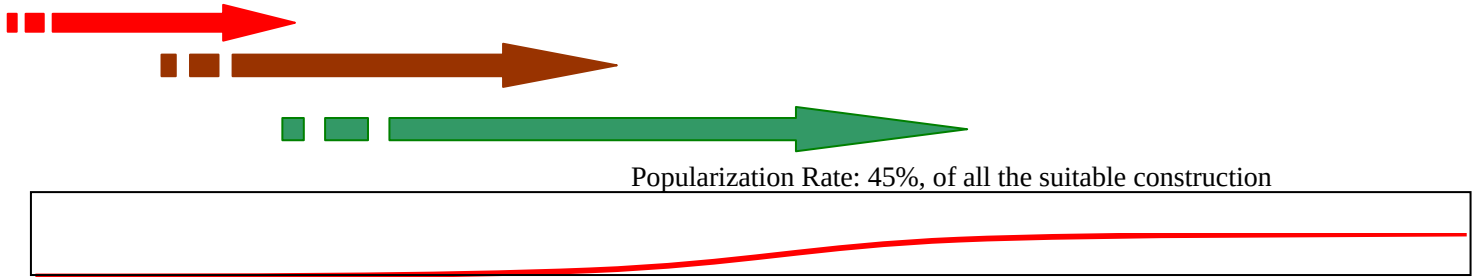
- Low carbon scenario up to 2050 for China
- Technology roadmap up to 2050
- Policy roadmap for deep cut in 2050
- Political roadmap for Climate change in China and the world
- Low carbon development for cities and provinces (more than 10 cities and provinces)
- Cost and benefit analysis
- Technology solution

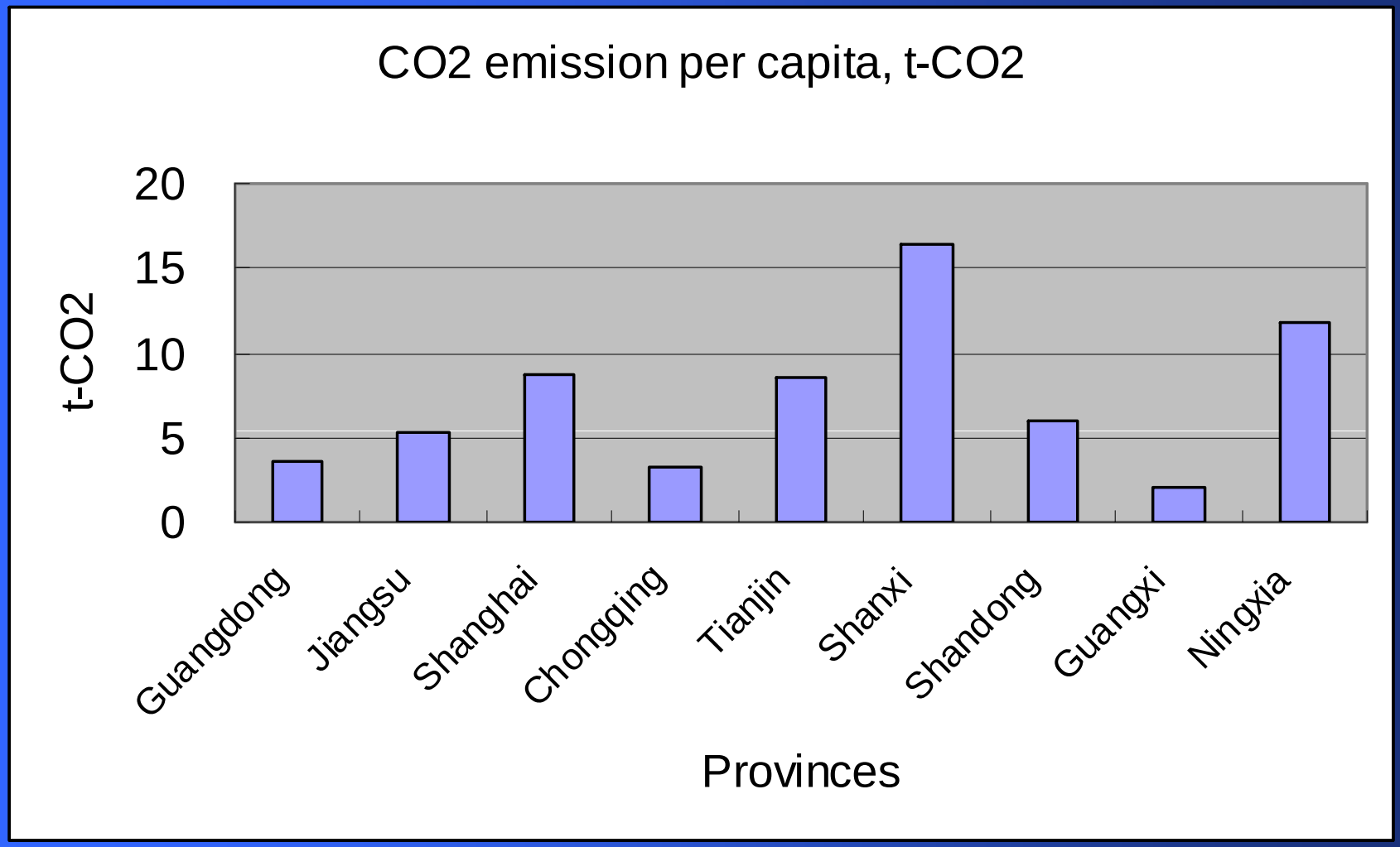

CO2 Emission in China
Mt-C
4000
3500
3000
2500
2000
1500
1000
500
0
2000
2005
2010
2020
2030
2040
2050
Baseline
Policy
ELC

28 key technologies in the enhanced low carbon scenario in China

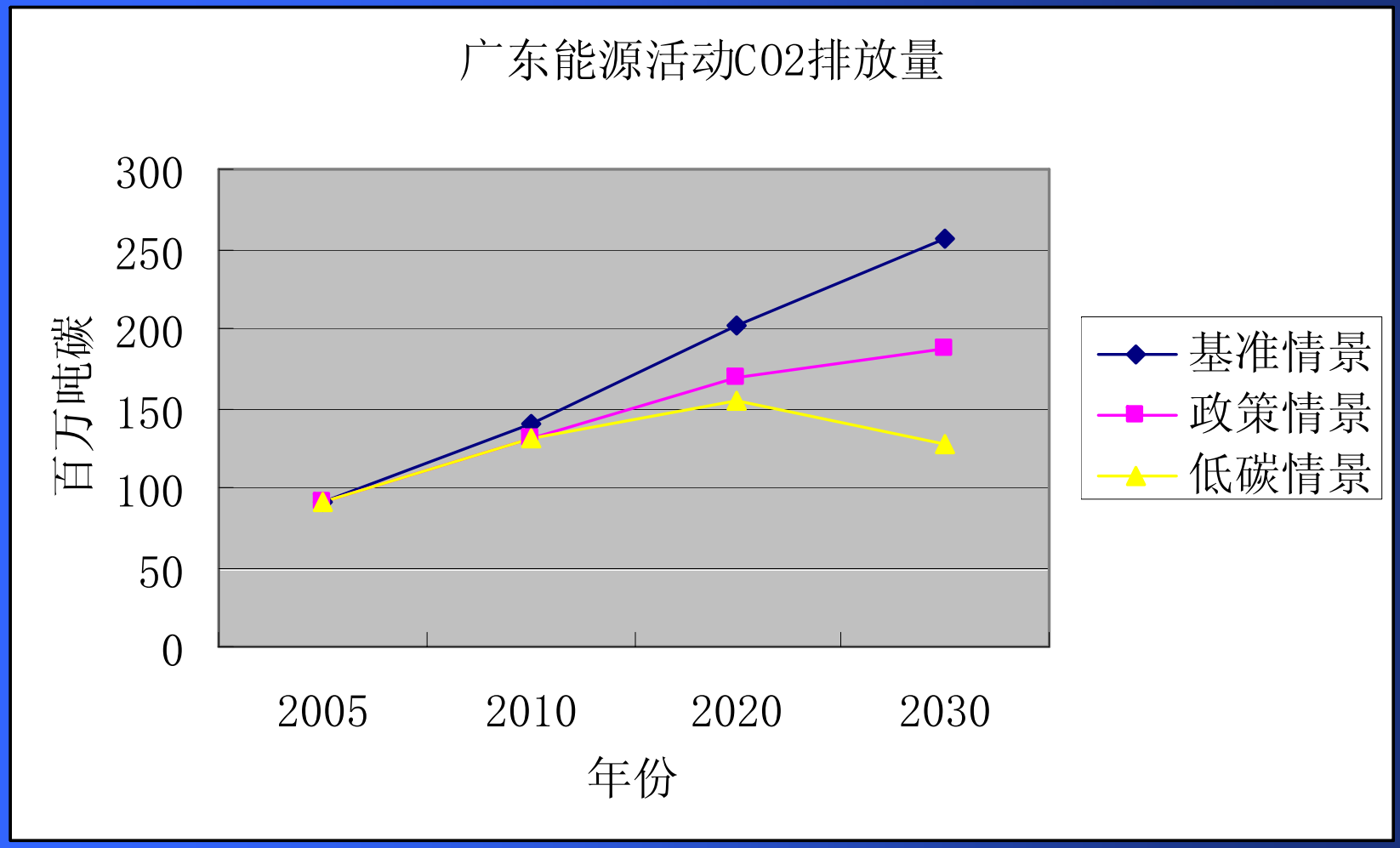
No.	Sector	Technology	Description	Note
1	Industry technology	High energy efficiency equipment	High efficiency furnace, kiln, waste heat recovery system, high efficiency process technologies, advanced electric motor	Nearly in market
2		New manufacture process technology for cement and steel		
3		CCS	In cement, steel making, refinery, ethylene manufacture	
4	Transport	Super high efficiency diesel vehicle	Advanced diesel hybrid engine	
5		Electric car		
6		Fuel cell car		
7		High efficiency aircraft	30% higher energy efficiency	
8		Bio-fuel aircraft		
9	Building	Super high efficiency air-conditioner	With COP>7	
10		LED lighting		
11		In house renewable energy system	Solar PV/Wind/Solar hot water and space heating	
12		Heat pumps		Mature
13		High isolation building		Mature
14		High efficiency electric appliance		Mature before 2030
15	Power generation	IGCC/Poly-Generation	With efficiency above 55%	
16		IGCC/Fuel cell	With efficiency above 60%	
17		On shore Wind		Mature
18		Off shore wind		Mature before 2020
19		Solar PV		
20		Solar Thermal		
21		4^{th} Generation Nuclear		
22		Advanced NGCC	With efficiency above 65%	
23		Biomass IGCC		
24		CCS in power generation		
25	Alternative fuels	Second generation bio-ethanol		
26		Bio-diesel	Vehicles, ships, vessels	
27	Grid	Smart grid		
28	Circulating tecnologies	Recycle, reuse, reducing material use		

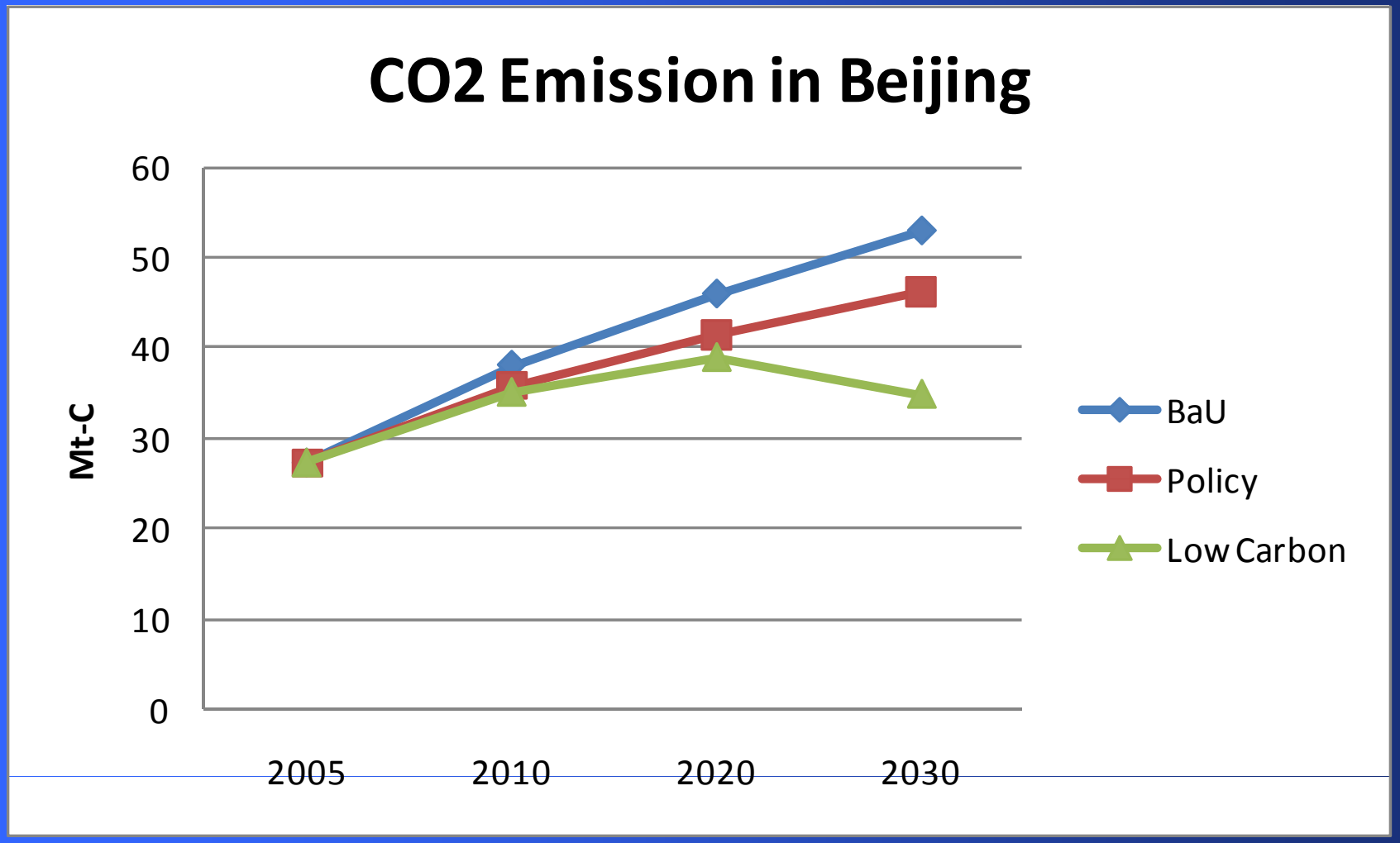
Technology Roadmap

Ultra performance air-conditioning	
Advanced Solar Water heater/ heating	

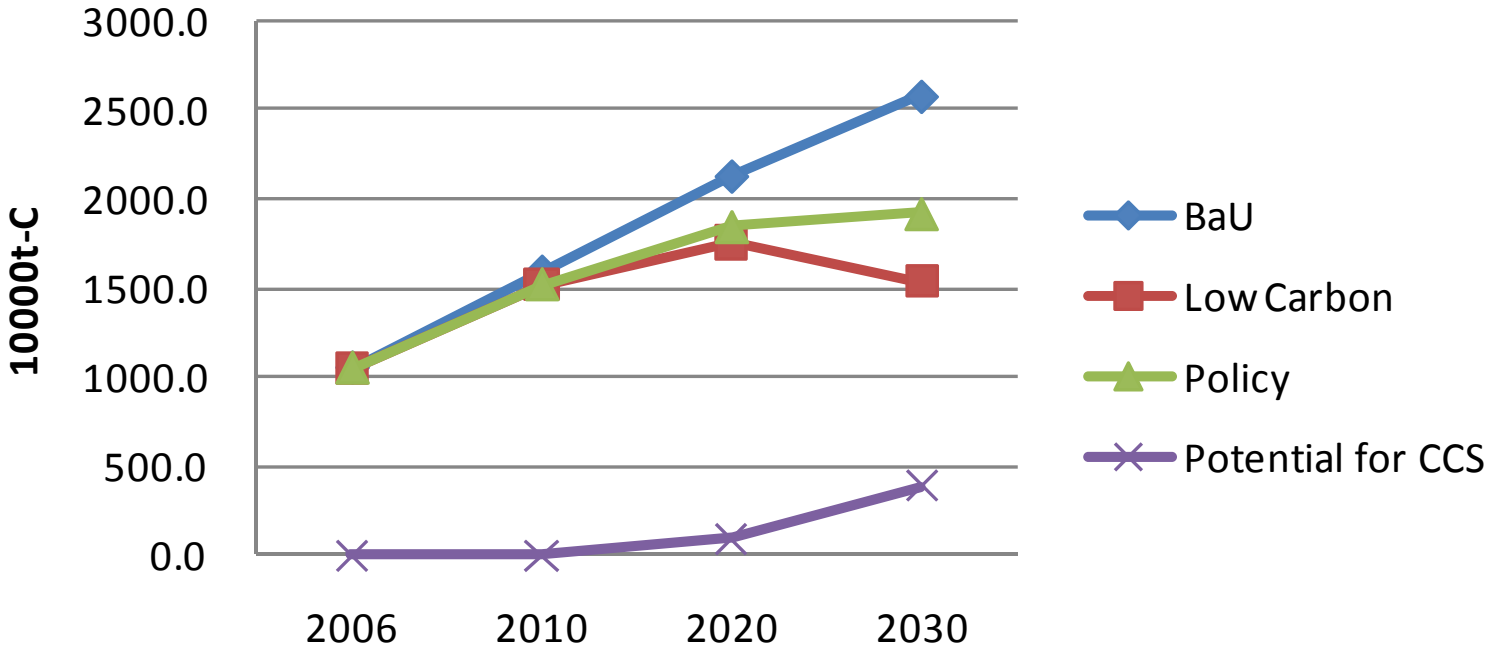

CO2 emission per capita, t-CO2
t-CO2
20
15
10
5
0
Guangdong
Jiangsu
Shanghai
Chongqing
Tianjin
Shanxi
Shandong
Guangxi
Ningxia
Provinces

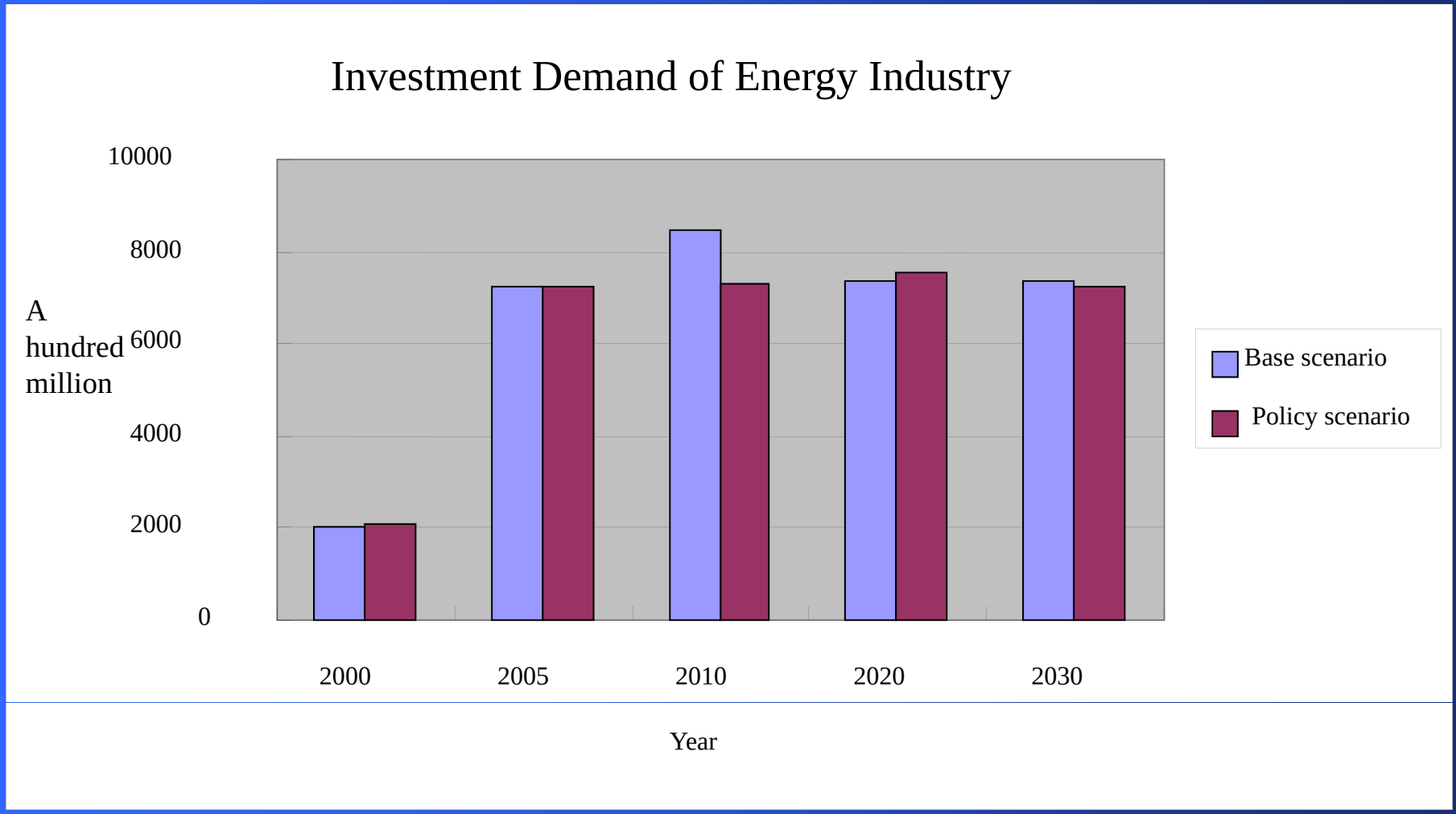
CO2 emission from energy activities in Guang Dong, mt-C



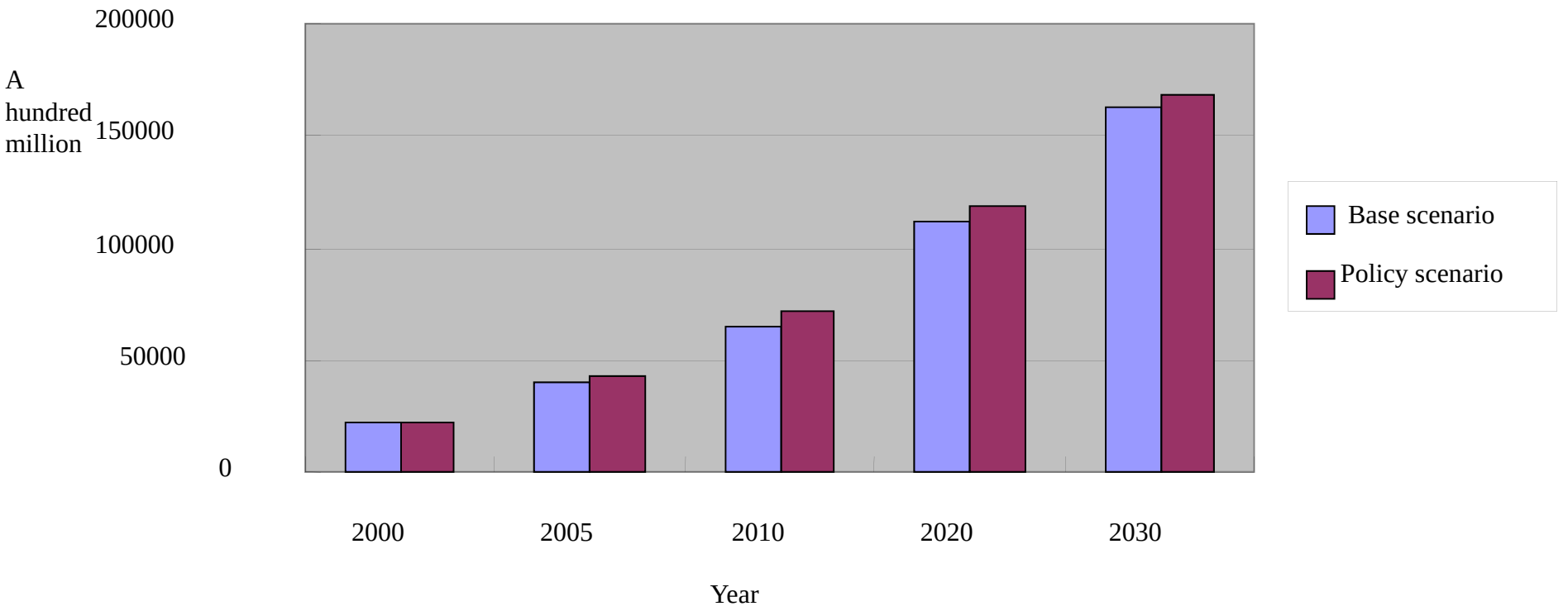

CO2 Emission in Beijing
Mt-C
60
50
40
30
20
10
0
2005
2010
2020
2030
BaU
Policy
Low Carbon

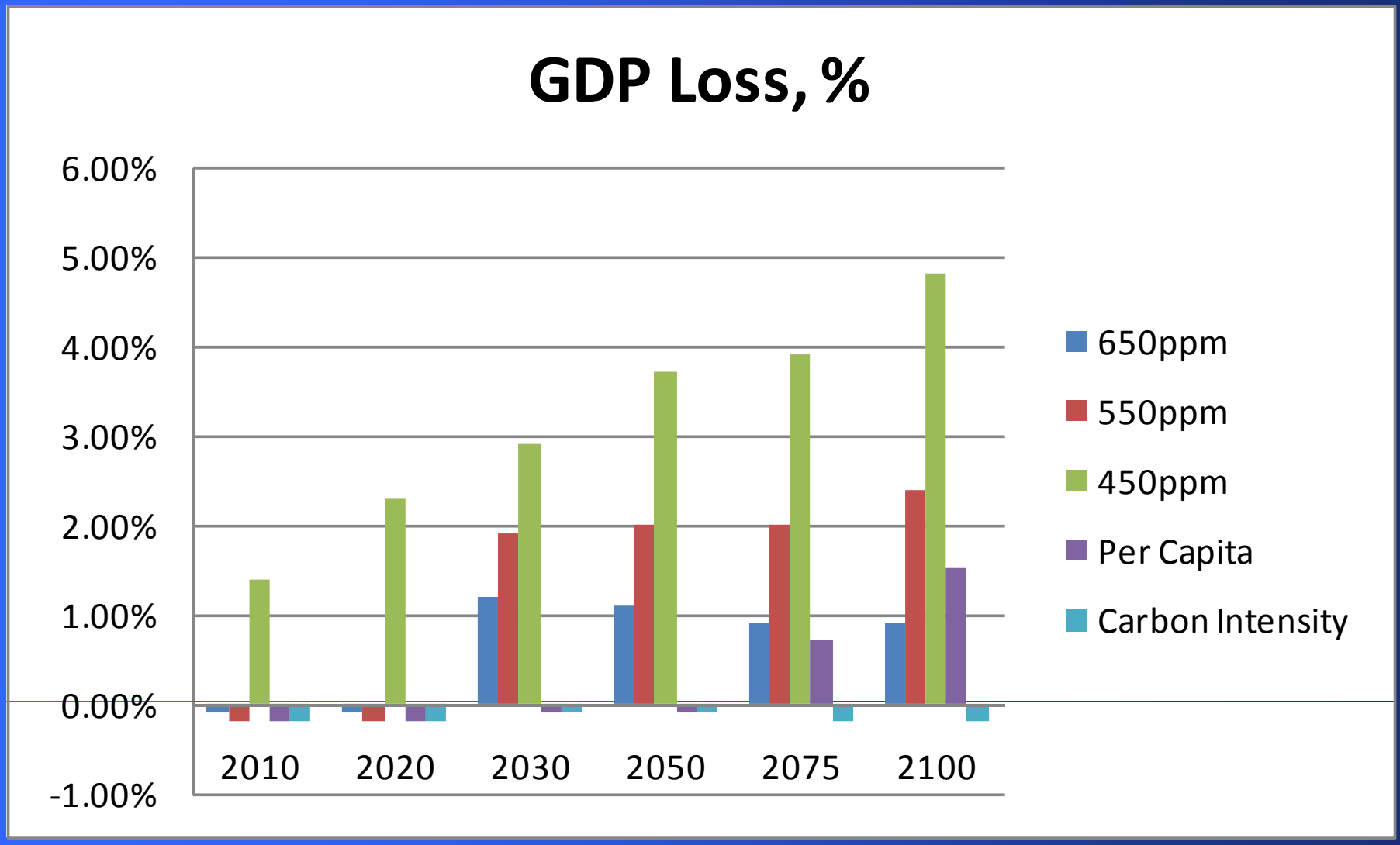
CO2 Emission from energy use: Jilin City



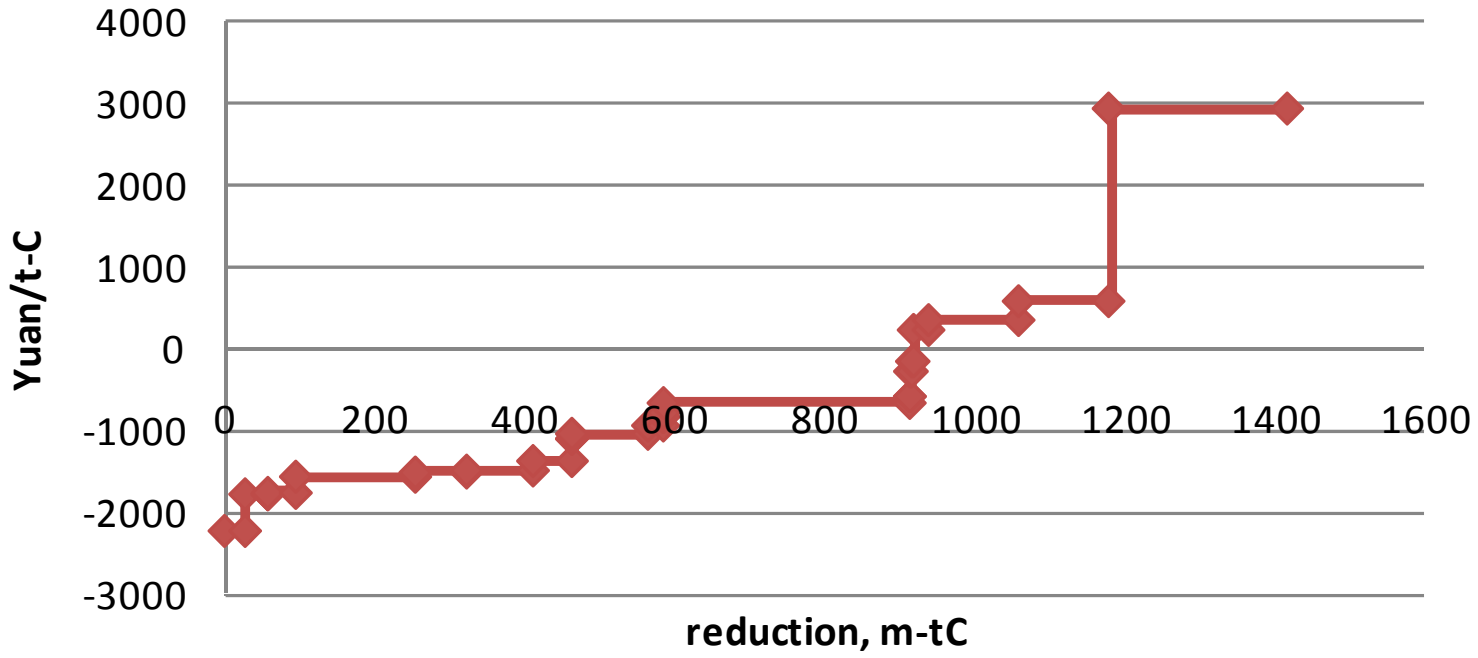

Investment Demand of Energy Industry
10000
8000
6000
4000
2000
0
A hundred million
2000
2005
2010
2020
2030
Year
Base scenario
Policy scenario

National Energy Expenses




GDP Loss, %
6.00%
5.00%
4.00%
3.00%
2.00%
1.00%
0.00%
-1.00%
2010
2020
2030
2050
2075
2100
650ppm
550ppm
450ppm
Per Capita
Carbon Intensity

Cost curve in power generation in China, 2050

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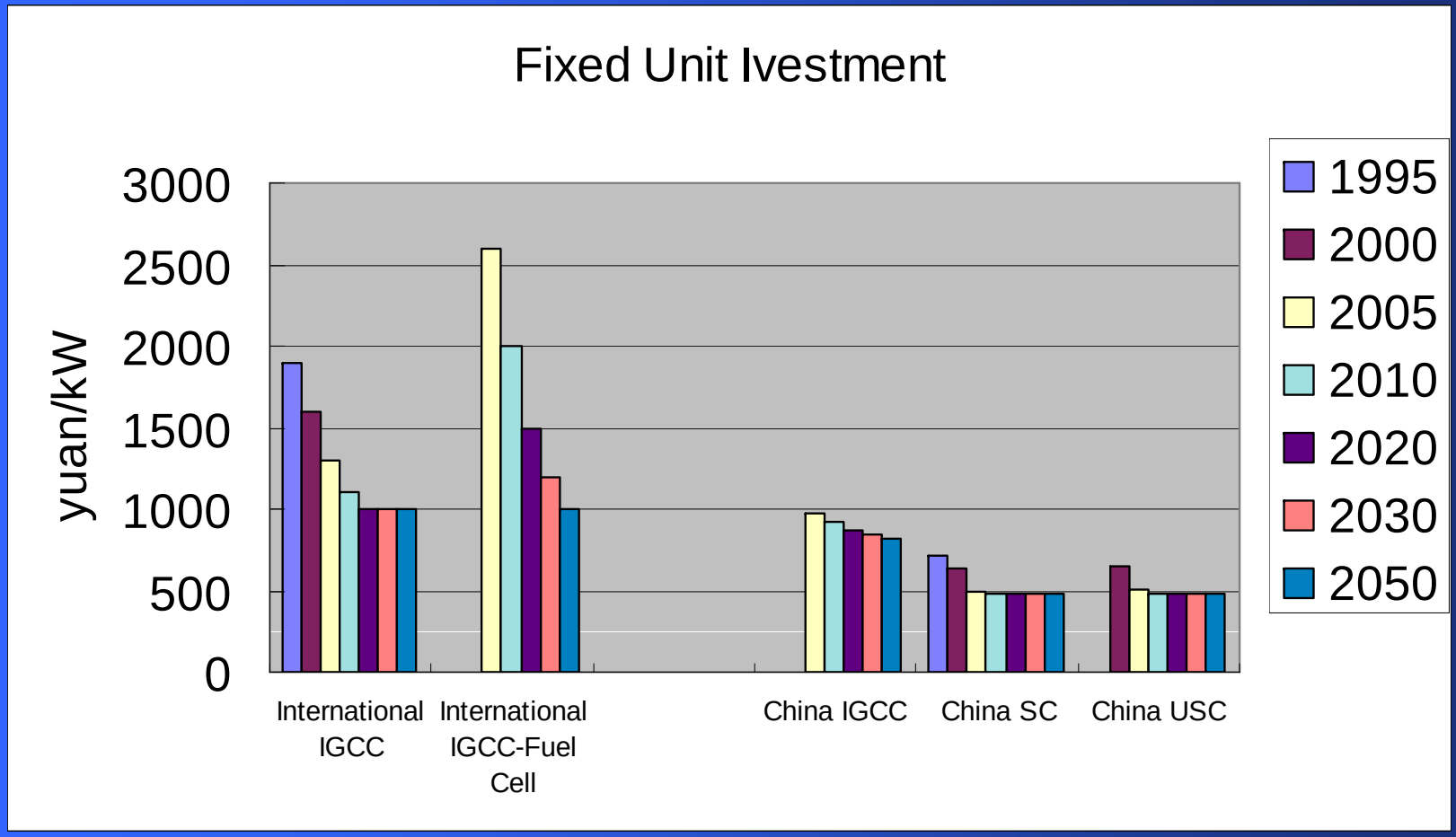
Fixed Unit Ivestment
yuan/kW
3000
2500
2000
1500
1000
500
0
International IGCC
International IGCC-Fuel Cell
China IGCC
China SC
China USC
1995
2000
2005
2010
2020
2030
2050